WORKSHOP
MAINTENANCE MANUAL

FOR THE

Royal Enfield

'Made like a Gun'

"SUPER METEOR"
MOTOR CYCLE

THE ENFIELD CYCLE COMPANY LIMITED

HEAD OFFICE AND WORKS:

REDDITCH, WORCESTERSHIRE, ENGLAND

Telephone :
Redditch 121 (8 lines)

Telegrams :
"Cycles, Phone, Redditch"

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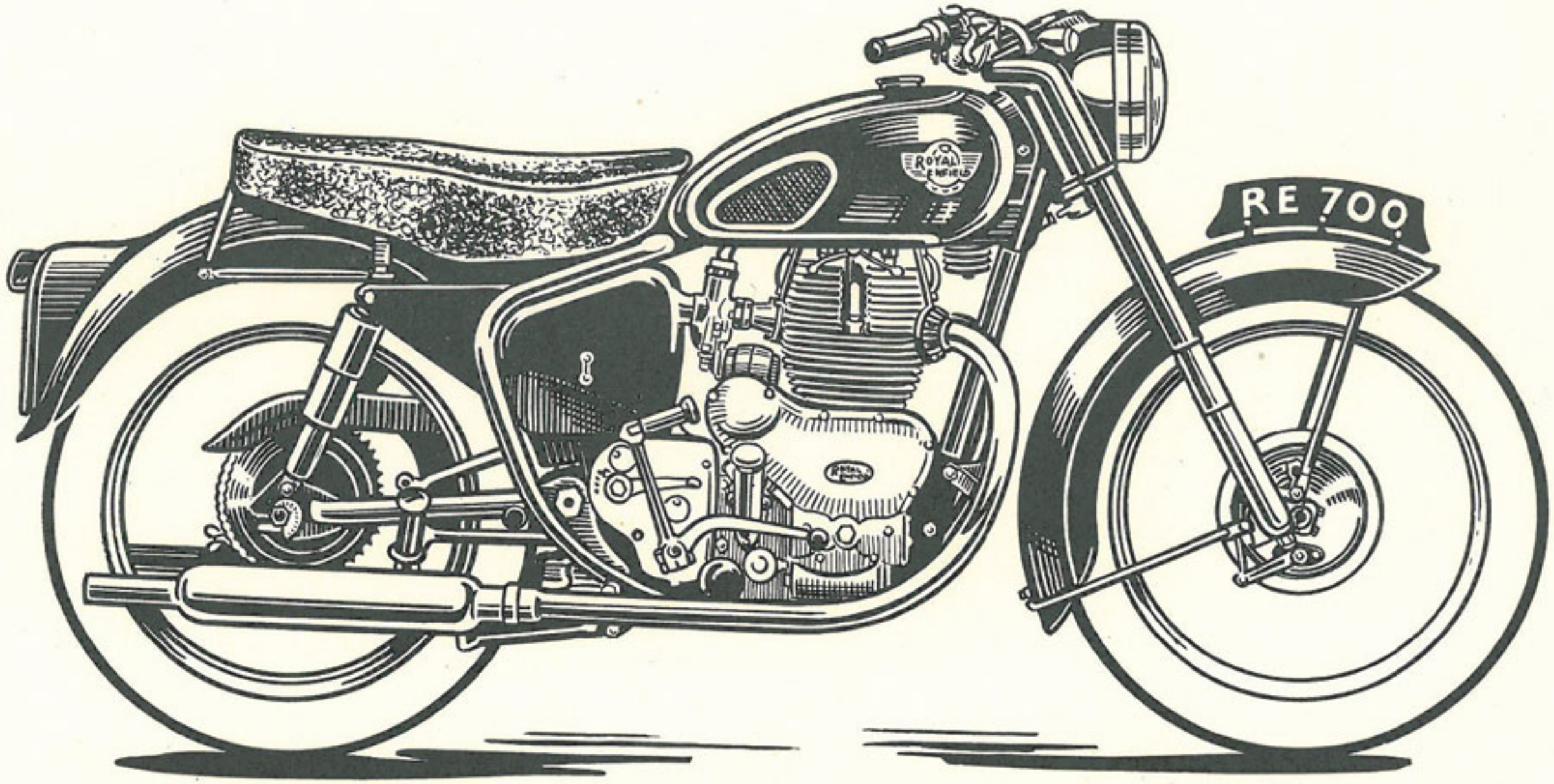


692 c.c. O.H.V. SPRING FRAME "SUPER METEOR"
(*Frontispiece*)

Contents

SECTION A4

Technical Data

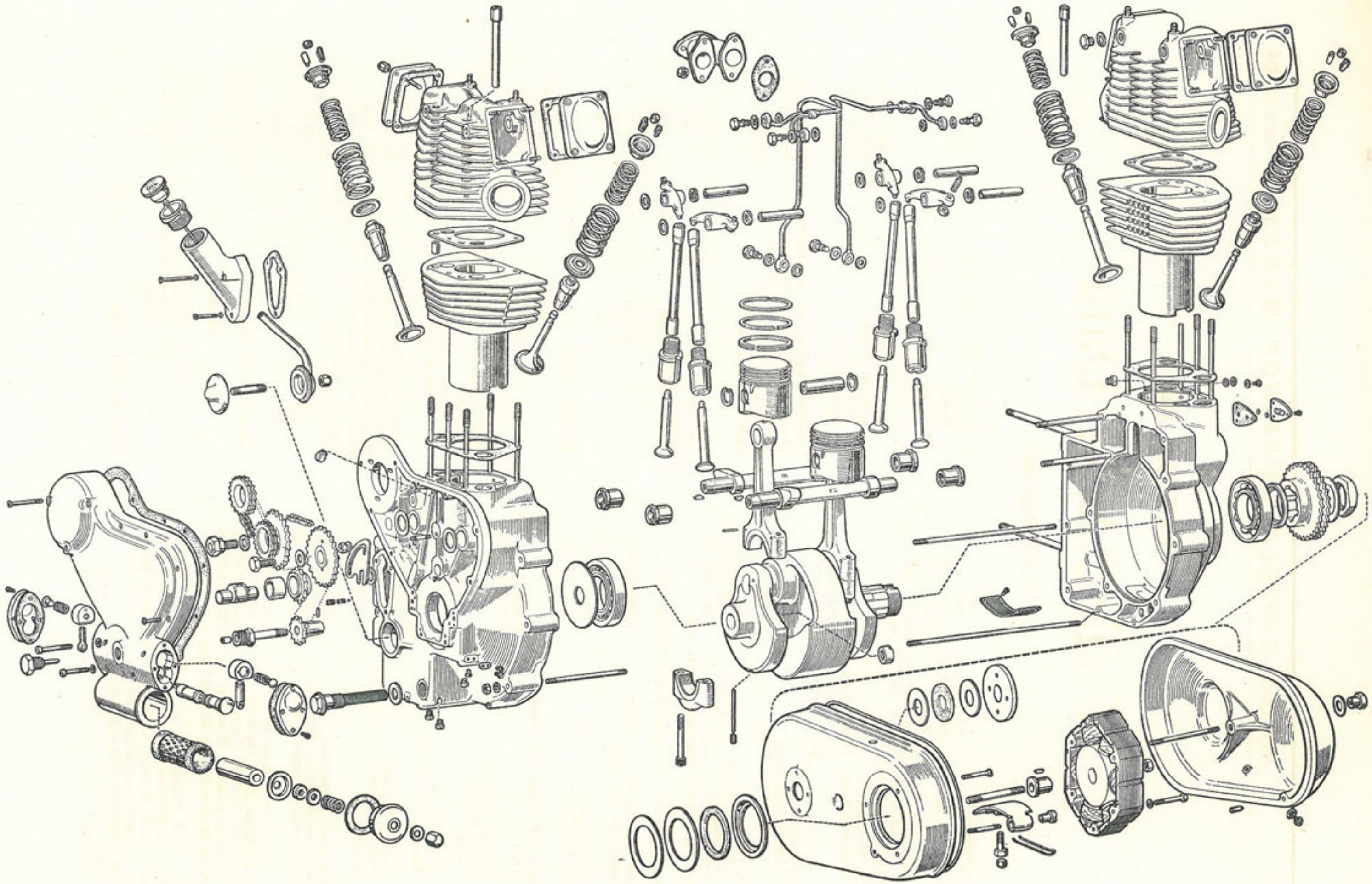
"Super Meteor" Engine

Cubic Capacity		692 c.c.
Stroke	Nominal	90 m.m.
Bore	Nominal	70 m.m.
	Actual	69·874 m.m./2·751 in.

(Rebore to ·020 in. when wear exceeds ·0065 in. and again to ·040 in. after further ·0065 in. wear.)

Compression Ratio	7½ to 1
Piston Diameter—	
Bottom of Skirt—Fore and Aft.	69·811 m.m.
Top Lands ...	69·40/69·35 m.m.
Skirt is tapered and oval-turned.	
Piston Rings—	
Width—Plain Rings	·0625/·0635 in.
Scraper Ring	·1550/·1560 in.
Radial Thickness	2·883/3·085 m.m.
Gap when in unworn Cylinder ...	·011/·015 in.
Clearance in grooves	·001/·003 in.
Renew Piston Rings when gap exceeds $\frac{1}{16}$ in.	
Oversize Pistons and Rings available ·020 and ·040 in.	
Piston Boss Internal Diameter ...	·7499/·7501 in.
Gudgeon Pin Diameter	·7499/·7501 in.
Con. Rod Small End Internal Diameter	·7507/·7505 in.
Big End Internal Diameter ...	1·8760/1·8755 in.
Crank Pin Diameter	1·875/1·8795 in.
Driving Side Main Ball Bearing—	
Type	Hoffman—145 or R and M—LJ 45
Outside Diameter	85 m.m.
Inside Diameter	45 m.m.
Width	19 m.m.
Timing Side Main Roller Bearing—	
Type	Hoffman—R145 or R and M—LRJ45
Outside Diameter	85 m.m.
Inside Diameter...	45 m.m.
Width	19 m.m.
Rocker Inside Diameter	·5627/·5622 in.
Rocker Bearing Inside Diameter ...	·5622/·5617 in.
Rocker Spindle Diameter	·5617/·5615 in.
Inlet Valve Stem Diameter... ...	·3430/·3425 in.
Exhaust Valve Stem Diameter ...	·3410/·3405 in.
Valve Guide Internal Diameter ...	·3437/·3447 in.
Valve Guide External Diameter ...	·6275/·6270 in.
Valve Guide Hole in Cylinder Head Dia.	·625/·626 in.
Tappet Stem Diameter	·3743/·3740 in.
Tappet Guide Internal Diameter	·3755/·3745 in.
Tappet Guide External Diameter ...	1·0125/1·0130 in.
Tappet Guide Hole in Crankcase Dia.	1·011/1·010 in.
Tappet Clearance with cold engine—	
Inlet	Nil
Exhaust	Nil

Valve Spring Free Length—	
Inner	2 1/32 in.
Outer	2 3/32 in.
(Renew when reduced by $\frac{3}{16}$ in.)	
Valve Timing with ·012 in. clearance—	
Exhaust Opens	75° before B.D.C.
Exhaust Closes	35° after T.D.C.
Inlet Opens	30° before T.D.C.
Inlet Closes	60° after B.D.C.
Camshaft Bearing External Diameter	·9095/·9085 in.
Camshaft Bearing Internal Diameter	·7505/·7495 in.
(Bored in position in crankcase)	
Cam Lift	·3125 in.
Valve Lift (approx.)	·3125 in.
Timing Sprocket	12 Teeth
Camshaft Sprocket	24 Teeth
Magneto Sprocket	19 Teeth
Timing Chain—Type ...	Single No. 110038 endless
Length	66 pitches
Width	·225 in.
Pitch	·375 in.
Roller	·250 in.
Magneto Chain—Type ...	Duplex No. 114500 endless
Length	44 pitches
Width	8·64 m.m.
Pitch	8 m.m.
Roller	5 m.m.
Magneto Speed	Half Engine Speed
Points	·015 in.
Timing Retarded	1/32 in. before T.D.C.
Timing Advanced ...	3/8 in.—7/16 in. before T.D.C.
Engine Sprocket	33 Teeth
Clutch Sprocket	56 Teeth
Final Drive Sprocket (Solo)	18 Teeth
Final Drive Sprocket (Sidecar) ...	16 Teeth
Primary Chain Type ...	Duplex No. 114038 endless
Length	94 pitches
Width	·628 in.
Pitch	·375 in.
Roller	·250 in.
Feed Oil Pump—Speed	1/6 Engine Speed.
Piston	·24975/.24950
Stroke	·5 in.
Return Oil Pump—Speed	1/6 Engine Speed.
Piston Diameter	·375/·3755 in.
Stroke	·5 in.
Sparking Plug. Type ...	Lodge H.14 K.L.G. F.70 Champion L10S
Diameter ...	14 m.m.



EXPLODED VIEW OF "SUPER METEOR" ENGINE
Fig. 1

SECTION B4

Engine Specification

"Super Meteor"

1. Engine

The engine is an even-firing vertical twin-cylinder, having separate cylinders and heads and fully enclosed pressure-fed overhead valve gear. It has dry sump lubrication with the oil tank integral with the crankcase and a massive one-piece high-strength cast iron crankshaft.

2. Cylinder Heads

The cylinder heads are die-cast from light aluminium alloy with ample finning to ensure adequate cooling. The exhaust pipe inserts are cast in and the valve inserts are of austenitic iron and are shrunk in so that they are replaceable. Steel wire thread inserts which are easily renewable are provided for the sparking plugs to prevent damage to the threads in the heads. The large capacity induction ports are streamlined and blended to the valve seatings.

3. Cylinders

The separate cast iron cylinders have a nominal bore of 70 m.m., the stroke being 90 m.m. The cubic capacity of the engine is 692 c.c. The cylinder heads are located on the cylinders by hollow dowels.

4. Pistons

The high compression pistons are of low expansion aluminium alloy, heat treated and form-turned oval and having split skirts. The compression ratio is 7¼ to 1. There are three piston rings, the top two of which are compression rings. Both are taper ground and the top one is chromium plated. The third ring is for oil control and is slotted.

5. Connecting Rods

The connecting rods are produced from stampings of Hiduminium RR56 light alloy. The little end bearings are of alloy direct on to the gudgeon pin. In case of wear after long service the little end can be bored out and fitted with a bush, but this is rarely necessary.

The big end bearings are of alloy direct to the crankshaft. The detachable bearing caps are bolted to the connecting rods by means of high tensile socket screws, secured by cotter pins.

6. Crankcase

The combined crankcase and oil tank is die-cast from light alloy in two halves, being split vertically.

7. Crankshaft and Flywheel

The crankshaft is cast in one piece, integral with the massive central flywheel, from high quality meehanite cast iron. The total weight is 26 lbs. and it is carefully balanced.

The main journals are ground and the big end journals are ground and hand-lapped.

8. Main Bearings

Heavy duty bearings are provided for the crankshaft, the driving side being ball and the timing side roller.

9. Camshafts

The camshafts are machined from drop forged steel stampings with the cams and bearings hardened and ground. The cam profiles are produced with silencing ramps to ensure quiet running.

10. Valves

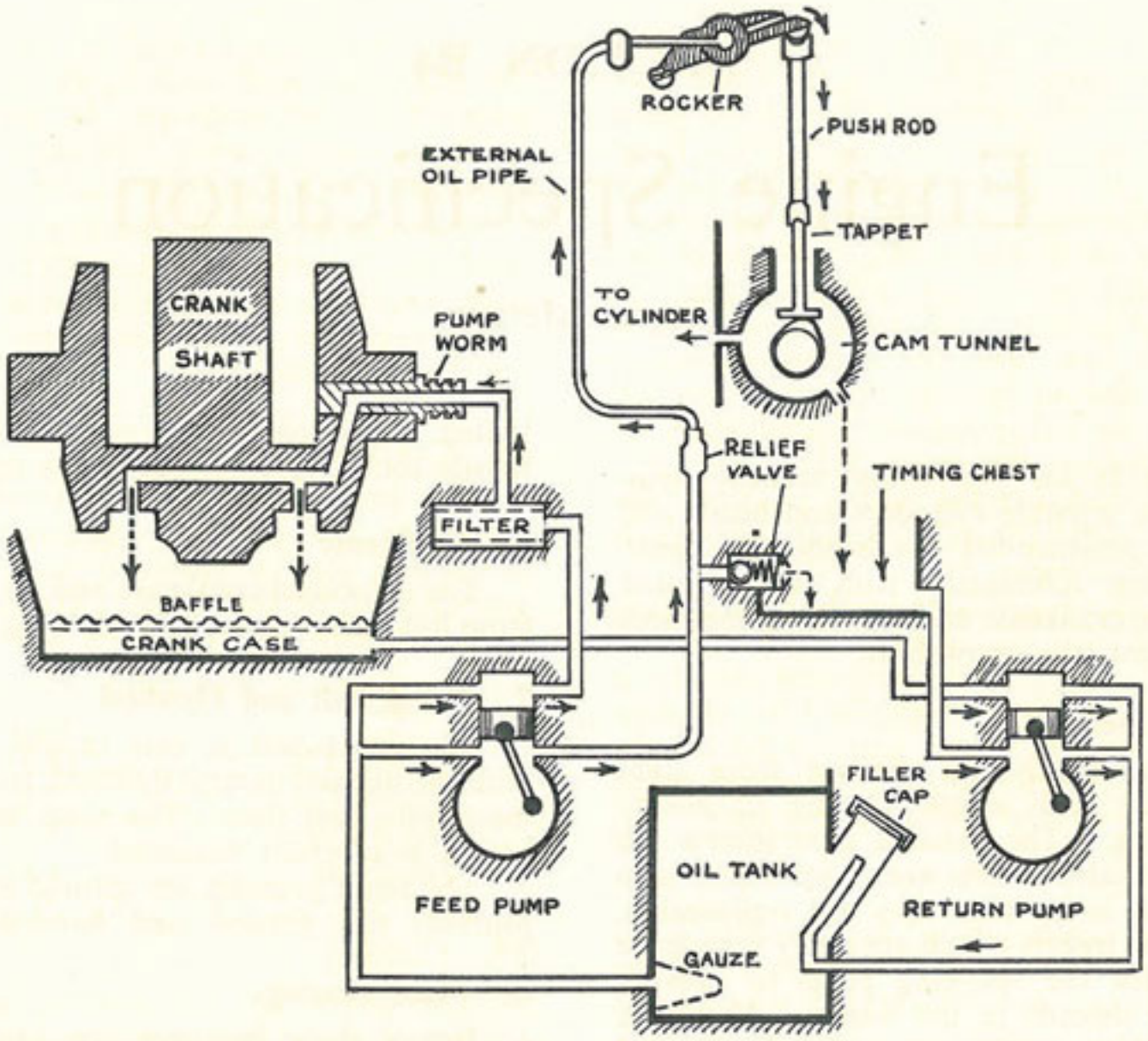
The inlet valves are machined from stampings of special Silicon-Chrome Valve Steel and the exhaust valves are of austenitic steel.

11. Valve Gear

The valves are operated from the camshafts by means of large flat based guided tappets, tubular alloy push rods and overhead rockers. Two compression springs are fitted to each valve.

12. Timing Drive

The camshafts are located in the crankcase, running in bronze bushes. They are driven by a common, endless chain from the timing sprocket on the crankshaft and the tightness of the chain can be adjusted by means of the chain tensioner in the timing chest.



"SUPER METEOR" LUBRICATION SYSTEM. Diagrammatic Arrangement
Fig. 2

The magneto is driven by a separate endless chain from the rear camshaft sprocket in the timing chest. The tension of this chain is adjusted by moving the magneto fixing bolts in their slotted holes.

13. Ignition and Lighting System. (See Section G)

Separate systems are provided for ignition and lighting. The former is by the latest type of Lucas brushless Magneto with rotating magnet and stationary contact breaker. The magneto runs at half engine speed and has a built-in distributor and double cam.

Lighting current is supplied by the battery which is charged through a rectifier from an alternator consisting of a rotating magnet mounted on the crankshaft and running in a six-coil stator in the primary chaincase.

14. Carburettor. (See Section F2)

Amal Monobloc, Type 376/36. Bore 1 1/16 in.

Main Jet	...	240
Needle Jet	...	Standard
Pilot Jet	...	30 c.c.
Throttle Valve	...	No. 3½
Needle Position	...	No. 3
Pilot Outlet	...	·025 in.

15. Air Filter

The air filter is a Vokes Micro-Vee felt and gauze dry filter, 5 in. diameter and housed in a compartment of the toolbox.

16. Lubrication System

Lubrication is by the Royal Enfield Dry Sump system which is entirely automatic and positive in action. The oil tank is integral with the crankcase, ensuring the full rate of circulation immediately the engine is started and rapid heating of the oil in cold weather.

There are two positively driven piston type oil pumps running at ⅛ engine speed, one at the rear of the timing cover for pumping oil to the bearings under pressure and the other at the front for returning the oil from the crankcase to the tank. The return pump has a capacity approximately double that of the feed pump which ensures that oil does not accumulate in the crankcase.

The oil from the big ends drains into the bottom of the crankcase and is prevented by a baffle from being drawn up by the flywheel.

The oil from the rocker bearings is squirted through a small hole in the rocker on to the top end

of the pushrod. It flows down the push rod into the cam tunnel where it lubricates the cams and tappets and thence into the timing chest, lubricating the timing chains. There are small holes from the cam tunnels through the cylinder walls for the purpose of lubricating the skirts of the pistons.

Both pumps are double acting, one side of the feed pump supplying the big ends only and the other side the rockers and valve gear. In a similar manner one side of the return pump pumps the big end oil back to the tank from the crankcase and the other side the valve gear oil back to the tank from the timing chest.

A spring loaded relief valve controls the pressure of the oil to the valve rocker gear which is through external pipes.

A gauze strainer is provided for the feed oil leaving the tank and there is a large capacity felt filter in the feed to the big ends. An aluminium cylinder is fitted over the fixing stud inside the filter element to reduce the volume of oil required to fill the filter after it has been dismantled for cleaning and to ensure the rapid flow of oil to the big ends.

17. Breather

The efficient operation of the breather is of paramount importance to the performance of the engine as it acts as a non-return valve between the crankcase and the outside atmosphere, causing a partial vacuum in the crankcase and rocker boxes which prevents the passage of oil into the cylinders and consequent smoking and oiling of the plugs.

The breather is located on the driving side of the crankcase and consists of a small housing attached to the crankcase by three screws and having a short rubber tube with flattened end, which acts as a non-return valve.

On some models the housing contains two pen-steel discs covering two holes drilled in the crankcase. Accurate seating of the discs is ensured by a pen-steel plate held between the breather body and the crankcase.

18. Gearbox

The gearbox is bolted on to the back of the crankcase and has four speeds, which are foot controlled, and a patented neutral finder. All gears are in constant mesh, changes being effected by robust dog clutches. (See Section E4).

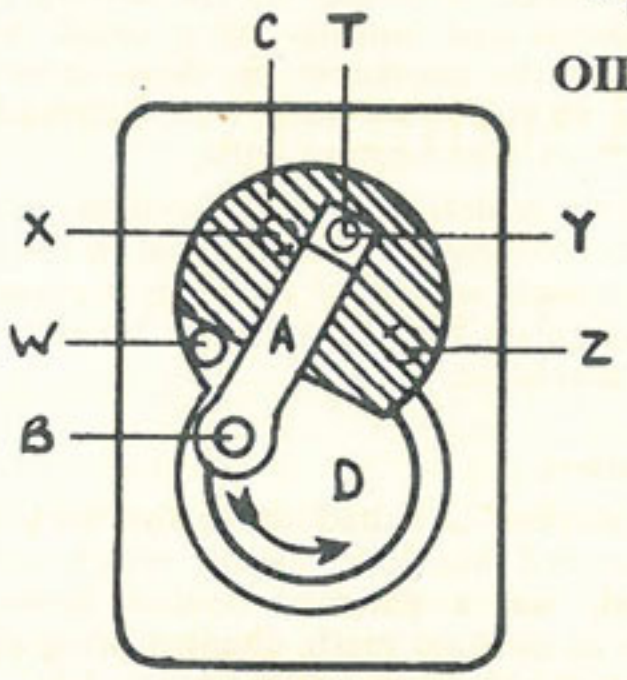
The standard gear ratios are as follows :—

	Solo	Sidecar
Bottom Gear ...	12·05	13·55
Second Gear	7·87	8·85
Third Gear	5·63	6·34
Top Gear	4·33	4·88

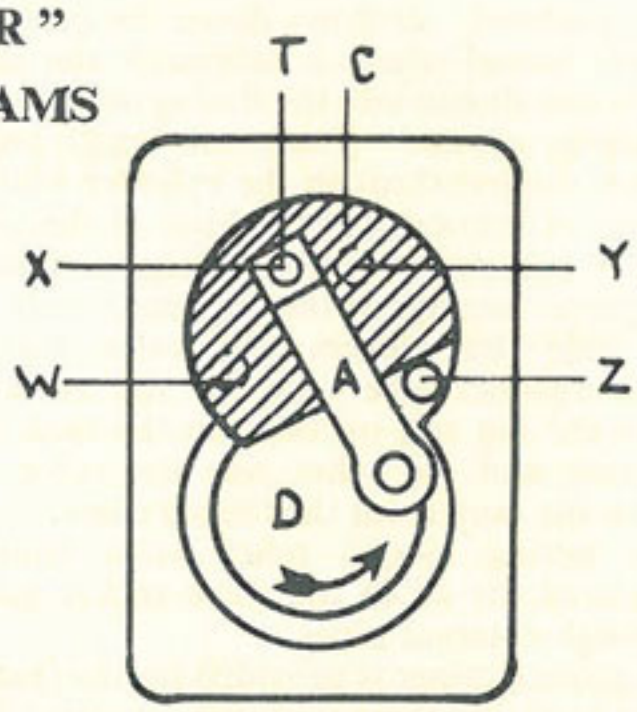
19. Clutch

The clutch has six pressure plates and five friction plates, including the sprocket which is lined on both sides with friction material. The other friction plates have Klinger inserts which give smooth operation and freedom from slipping in the presence of oil.

"SUPER METEOR"
OIL PUMP DIAGRAMS



FEED PUMP
POSITION 1



FEED PUMP
POSITION 2

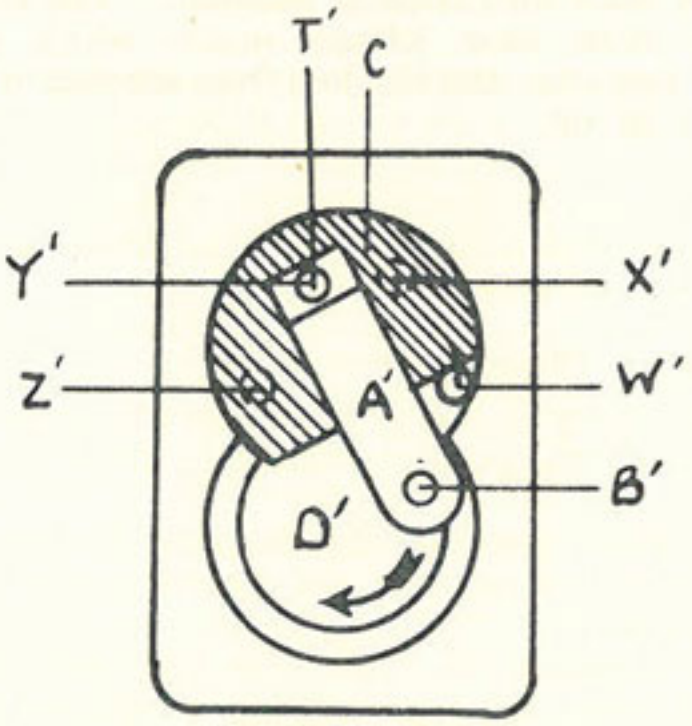
Fig. 3A

The ports in the housing are connected as follows :

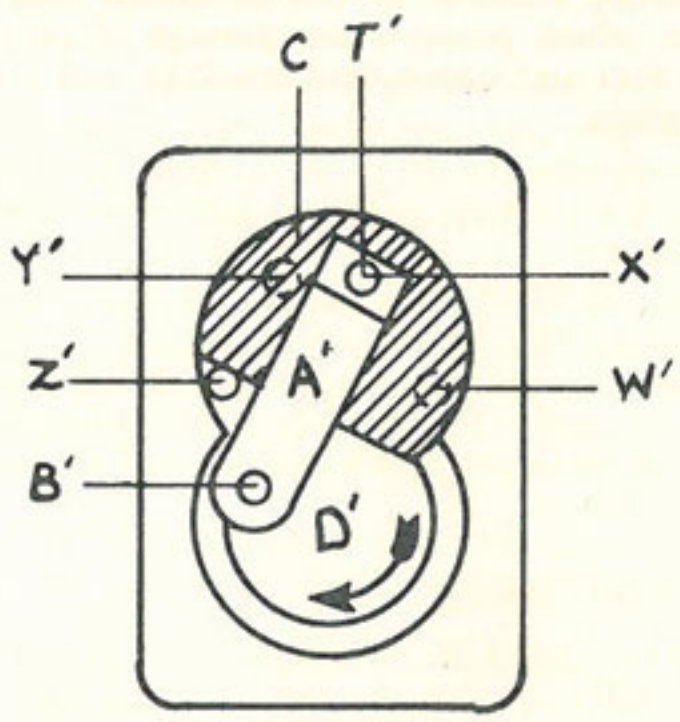
W — delivery to rocker gear.
X — delivery to big ends.
Y — suction from oil tank.
Z — suction from oil tank.

Position 1. The plunger A is being drawn out of the cylinder hole in the disc C by the action of the peg B on the shaft D. The port T in the disc C registers with the suction port Y in the housing, so that oil is drawn into the cylinder from the oil tank. At the same time the delivery port W in the housing is uncovered and oil below the disc in the housing is forced through W to the rocker Gear.

Position 2. The plunger A is being pushed into the cylinder hole in the disc C. The port T in the disc now registers with the delivery port X in the housing, so that oil is forced out of the cylinder to the big ends. At the same time the suction port Z in the housing is uncovered and oil is drawn into the housing below the disc from the oil tank.



RETURN PUMP
POSITION 1



RETURN PUMP
POSITION 2

Fig. 3B

The ports in the housing are connected as follows :—

W′ — delivery to oil tank.
X′ — delivery to oil tank.
Y′ — suction from crankcase.
Z′ — suction from timing chest.

Position 1. The plunger A′ is being drawn out of the cylinder hole in the disc C′ by the action of the peg B′ on the shaft D′. The port T′ in the disc C′ registers with the suction port Y′ in the housing, so that oil is drawn into the cylinder from the crankcase sump. At the same time the delivery port W′ in the housing is uncovered and oil below the disc in the housing is forced through W′ back to the oil tank.

Position 2. The plunger A′ is being pushed into the cylinder hole in the disc C′. The port T′ in the disc now registers with the delivery port X′ in the housing, so that oil is forced out of the cylinder back to the oil tank. At the same time the suction port Z′ in the housing is uncovered and oil is drawn into the housing below the disc from the timing chest.

SECTION C4

Service Operations with Engine in Frame

"Super Meteor"

1. Removal of Timing Cover

First place a tray under the engine to catch the oil which will escape when the cover is removed. Remove the timing side exhaust pipe and the oil filler neck, by taking out the three screws fixing it to the crankcase. Remove the timing cover fixing screws. Draw off the timing cover, tapping it lightly if necessary.

In refitting the cover, insert the two long screws through the cover to locate the gasket. See that the thrust washer is on the chain tensioner sprocket spindle and that the neoprene seal is in position on the oil feed plug. If the seal is split or otherwise damaged, a new one should be fitted, of the latest type, which is captive on the feed plug. The feed plug is Part No. 42113; seal is Part No. 42114. If the plug is damaged it should be renewed to ensure oil pressure to the big end bearings.

The refitting of the cover will be facilitated if the engine is turned gently forwards while the cover is being put into place. This will help the engagement of the pump worm with the pump spindle and prevent damage to the gears.

Always fill the filter with clean oil before refitting the timing cover and always take great care not to damage the gasket where the section is narrow.

To verify that the oil pumps are working after replacing the timing cover, start the engine and remove the oil filler cap so that the oil return pipe can be seen. It may take several minutes for all the oil passages to fill and the oil to commence to circulate.

2. Valve Timing

The camshaft sprockets are keyed to the camshafts so that the valve timing can only be incorrect if the timing chain is incorrectly fitted.

The correct setting is obtained with the marks stamped on the camshaft sprockets facing each other inwards on the centre line and the mark on the crankshaft sprockets pointing vertically downwards. If it is necessary to remove the sprockets see Subsections 23 and 24.

Remember that all three timing sprockets fixing bolts have **Left Hand Threads.** While tightening the camshaft bolts the sprockets should be held.

The correct valve timing at ·012 in. clearance is as follows:—

Exhaust opens 75° before bottom dead centre.
Exhaust closes 35° after top dead centre.
Inlet opens 30° before top dead centre.
Inlet closes 60° after bottom dead centre.

3. Tappet Adjustment

The tappet clearance is adjusted by means of a screw in the outer end of the rocker. Access to the adjusting screws is obtained by removing the covers of the rocker boxes.

The clearance between the end of the screw and the valve stem cap should be nil or as little as possible with the engine **COLD.**

To adjust the clearance, loosen the locknut beneath the rocker arm, turn the screw with a small spanner and re-tighten the locknut.

The adjustment for each valve should be made with the corresponding valve of the other cylinder fully open. This ensures that the tappet is well clear of the ramp which is located on either side of the cam to reduce valve noise.

If, after long service, the valve stem cap or the rocker adjusting screw are found to be worn, they should be renewed, as uneven thrust due to the screw being in a different position after adjustment may cause lateral movement of the rocker giving rise to a sharp tapping noise.

4. Ignition Timing

The setting of the ignition depends upon the position of the sprocket relative to the magneto shaft.

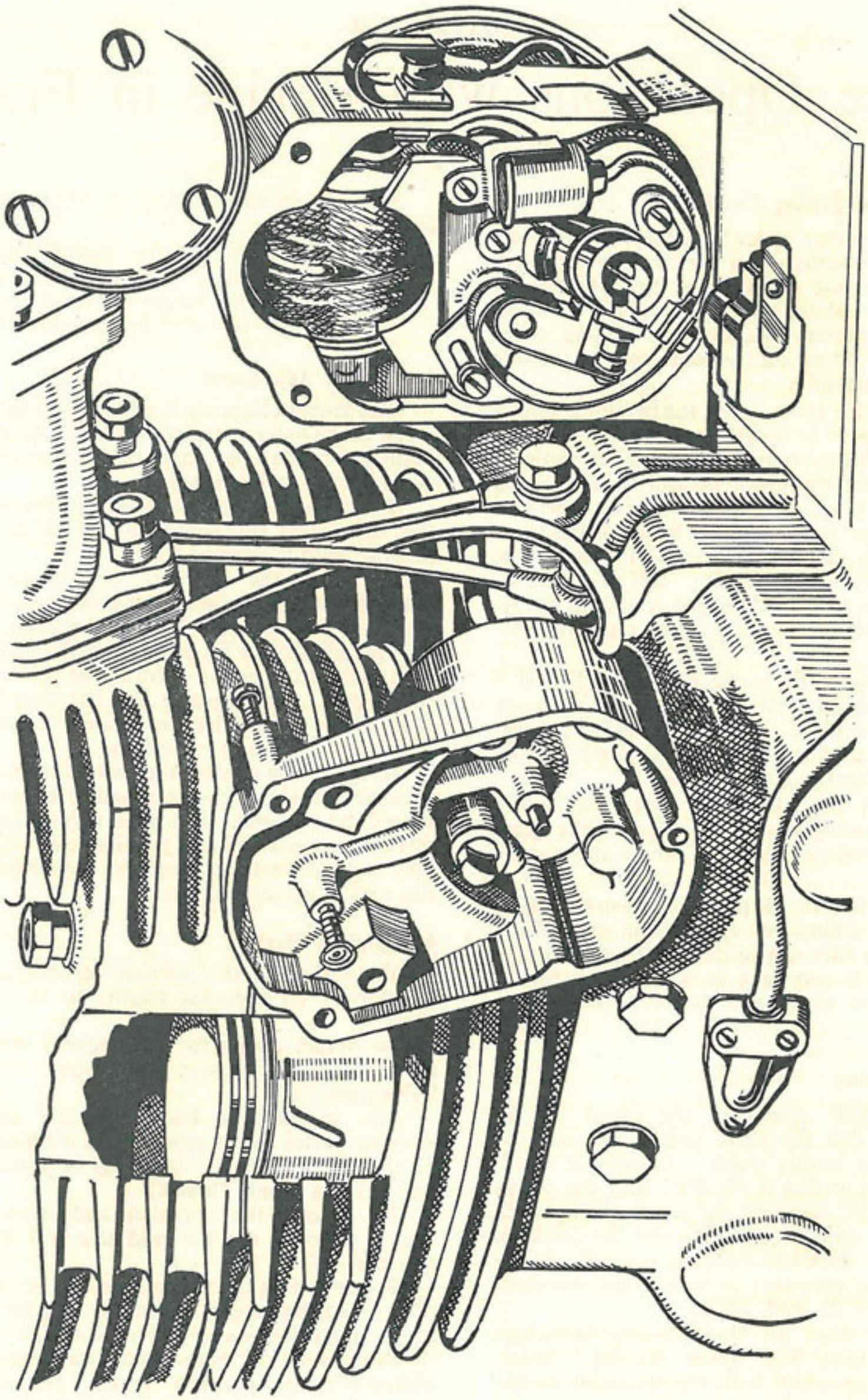
To obtain access to the magneto sprocket it is necessary to remove the timing cover (see Subsection 1).

The sprocket is built into the automatic advance device and is mounted on a smooth taper on the magneto shaft. It is held in position by a nut. **(Right Hand Thread.)**

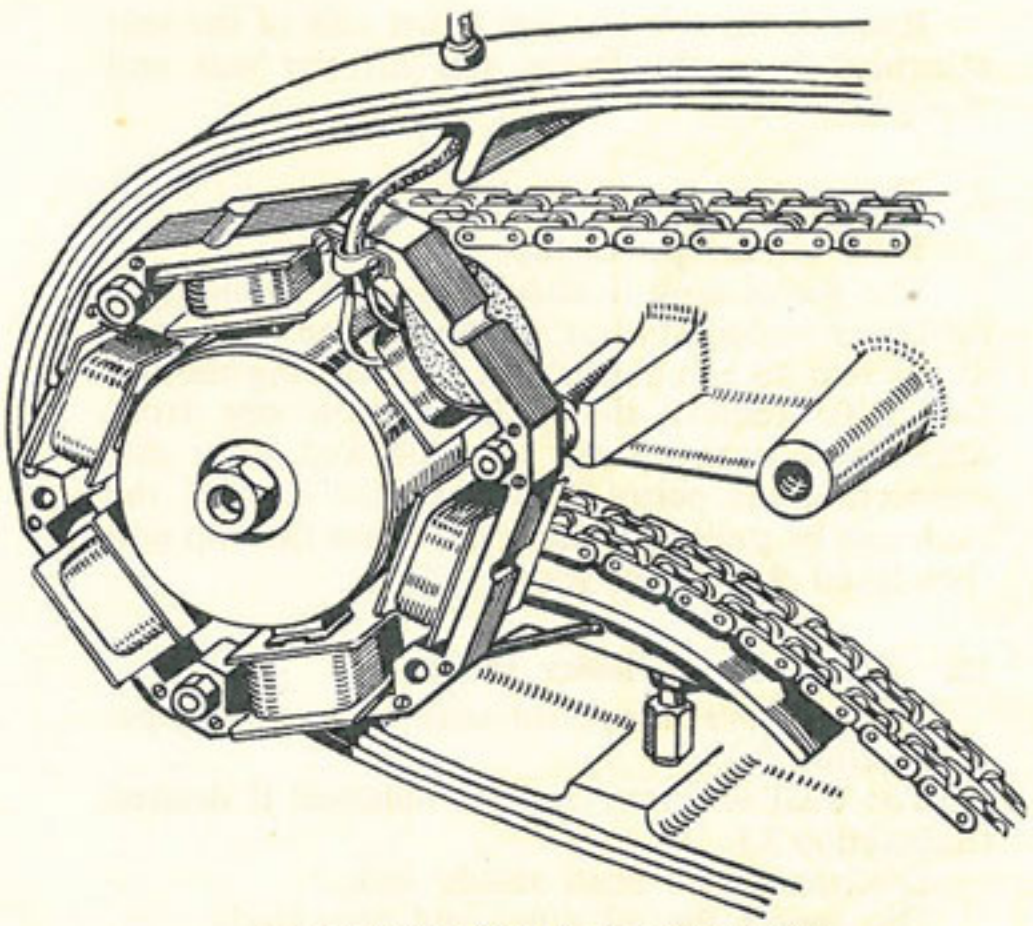
To remove the sprocket and auto-advance device, unscrew the nut and this will draw the sprocket off.

Before setting the timing remove the rotor arm of the distributor and adjust the contact breaker points to a clearance of ·015 in. when fully opened.

Because of the auto-advance mechanism, the timing is normally in the "retard" position when the engine is stationary. Rotate the two halves



MAGNETO TIMING
Fig. 1



PRIMARY CHAIN ADJUSTMENT
Fig. 2

of the coupling relatively to each other against the springs, i.e. into the ''advance'' position, and hold it in this position with a piece of wire.

To set the timing, turn the engine until the pistons are $\frac{3}{8}$—$\frac{7}{16}$ in. before top dead centre on the compression stroke of the left hand cylinder, i.e. with both valves closed.

Insert a thin piece of tissue paper between the points of the contact breaker and turn the magneto forwards until the paper can just be pulled out, making sure that the rotor arm of the distributor when replaced will be pointing towards the segment connected to the left hand sparking plug lead.

Tighten the sprocket and auto-advance device on to the magneto shaft, taking care that it does not slip.

Remove the piece of wire holding the auto-advance mechanism.

The timing can be checked by removing the cap from the magneto and holding the rotor arm of the distributor in the advanced position, which is $\frac{3}{8}$—$\frac{7}{16}$ in. before top dead centre, without the necessity of taking off the timing cover.

On no account must the cam be altered from its original position on the rotor shaft or the efficiency of the magneto will be affected.

5. Primary Chain Adjustment

The tension of the primary chain can be checked through the inspection cover in the primary chain case and, should it require adjustment, access to the adjuster is gained by removing the chain case cover, which is held in position by a single nut. Before removing the nut, place a tray under the engine to catch the oil from the chaincase.

Beneath the bottom run of the chain is a curved slipper on which the chain rests and which may be raised or lowered by turning the adjusting screw after having first slackened the locknut.

A rubber button is fitted to the end of the adjusting screw to prevent the transmission of chain noise to the chaincase and this is held against the chaincase by a hairpin spring, which prevents it from bouncing.

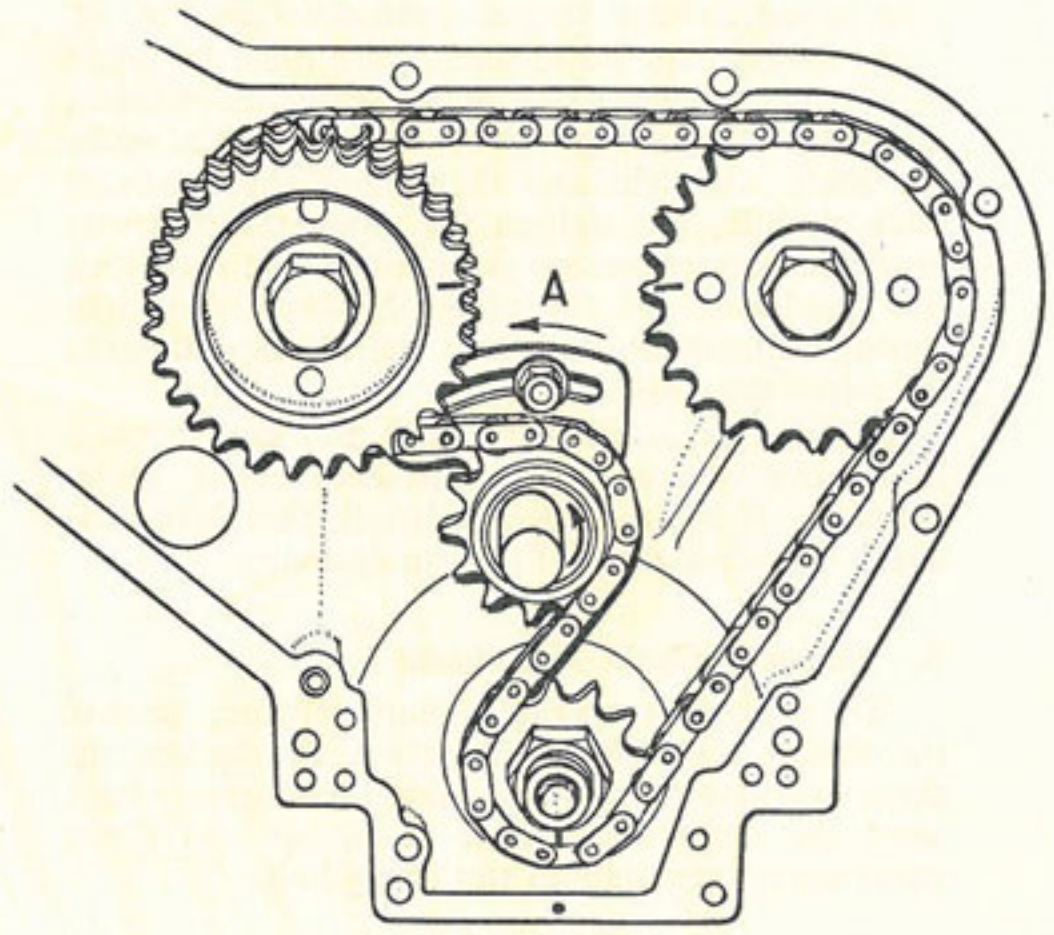
After replacing the chain cover, remember to replenish the chaincase with oil.

Do not adjust the chain to be dead tight but rotate the engine slowly and, while doing so, test the tension of the top run of the chain by pressing it up and down with the fingers. Adjust the tension so that there is $\frac{1}{4}$ in. up and down movement at the tightest spot.

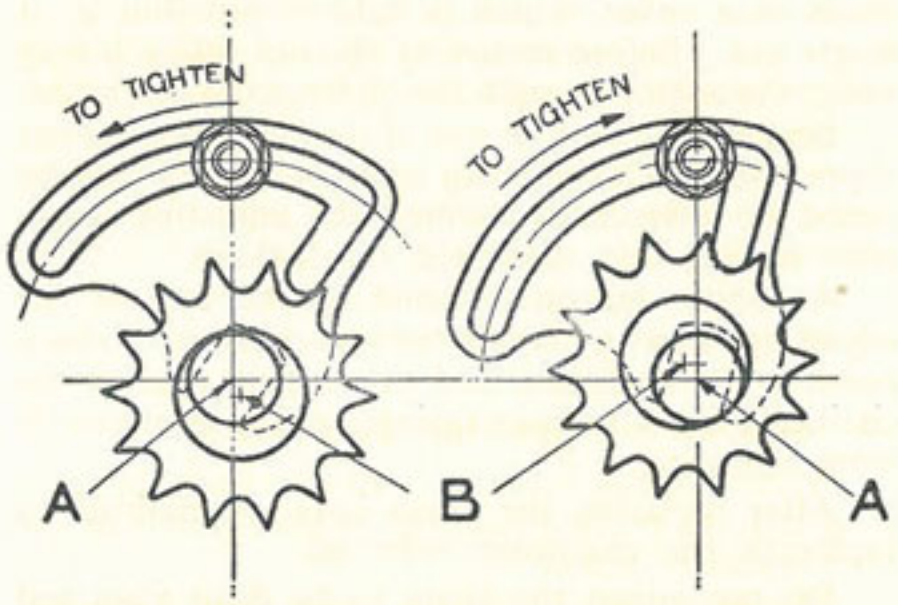
Re-tighten the locknut on the adjusting screw, replace the chain cover and replenish with oil.

6. Timing Chain Adjustment

Before adjusting the tension of the timing chain, turn the engine until the chain is in its tightest position and any slack is between the rear cam sprocket and the timing sprocket on the engine shaft.



TIMING CHAIN ADJUSTMENT SHOWING TIMING MARKS
Fig. 3



TIMING CHAIN ADJUSTMENT

Fig. 4

The tension of the timing chain is altered by moving the quadrant after slackening the nut A which secures it (see Fig. 3). This rotates the eccentric spindle on which the chain tensioner jockey sprocket is mounted. Tightening of the chain is effected by moving the quadrant to the left.

It is imperative that the quadrant is fitted the right way round and that the eccentric spindle is fitted correctly in the quadrant fork. If the chain tightens when the quadrant is moved to the right, the tensioner has been wrongly assembled and may cause damage to the quadrant (see Fig. 4).

In making the adjustment, care must be taken to see that any backlash in the quadrant is taken up in the "tightening" direction, i.e., do not make the chain too tight and then move the quadrant back slightly, but tighten the chain progressively until the correct tension is obtained and then lock the quadrant. If the chain becomes too tight during adjustment, slacken it right back and make the adjustment again.

If the chain is maladjusted, it may give rise to a loud noise which can be mistaken for a faulty bearing. If such a noise is heard, therefore, first check the adjustment of the timing chain.

7. Magneto Chain Adjustment

To adjust the magneto chain tension, remove the timing cover (see Subsection 1), slacken the three magneto fixing bolts, slide the magneto back until the chain has about $\frac{3}{16}$ in. up and down movement, then tighten the fixing bolts.

8. Removal of Dual Seat and Rear Mudguard

Disconnect the leads to the rear lamp by pulling out the plugs in the connectors near the tool box.

Remove the two nuts on either side of the seat attaching it to the frame and lift the seat and mudguard off.

9. Removal of Petrol Tank

Turn off the petrol tap.

The petrol tank is attached to the frame by a rubber mounted stud at the front, and is clipped at the rear to a rubber sleeve surrounding the top tube. To remove the tank, unscrew one front attachment nut, tap out the stud and, after disconnecting the petrol feed pipe, the rear of the tank can be pulled upwards to release the clip and then lifted clear of the frame.

10. Removal of Cylinder Head

First remove the petrol tank and petrol pipe. (Subsection 9.)

The dual seat may also be removed if desired (Subsection 8.)

Disconnect the head steady link.

Disconnect the oil pipes and plug leads.

Remove the exhaust pipes and carburettor and induction pipe.

Remove the rocker box covers.

Turn the engine until both valves are closed.

Remove the five cylinder head nuts and lift off the head.

In replacing the head, see that the dowels are in position in the cylinder barrel and that the push rods are the right way up (shallow cups upwards).

Apply a thin coat of jointing compound to both sides of the gasket and place it in position.

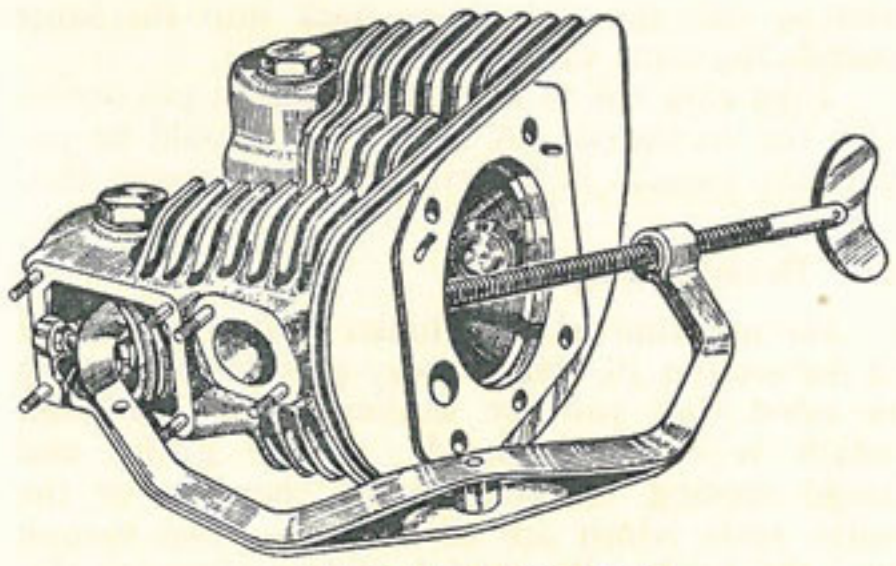
Lower the cylinder head over the push rods, making sure that the rockers locate in the push rod cups.

Fit the head nuts and washers and partially tighten down.

When both heads have reached this stage, fit the induction pipe and tighten the nuts. The cylinder head nuts can now be finally tightened down progressively and diagonally from one side to the other to prevent distortion. After the engine has been run long enough to get thoroughly hot, the tightness of the nuts should be re-checked.

11. Removal of Valves

Remove the rocker-box covers, each held by four nuts, swing the rocker clear of the valve and lift or prise away the hardened steel thimble or end cap. If this has stuck, it can be removed by means of a screwdriver. Using a suitable valve spring compressing tool, compress the valve springs and remove the split conical collets from the end of the valve stem. Slacken back the compressing tool and release the springs. Withdraw the valve and place its springs, top spring collar (and bottom



REMOVAL OF VALVES
Fig. 5

collar if it is loose) and split conical collets together in order that they may be re-assembled with the valve from which they were removed.

Deal similarly with the other valves in the heads.

If the valve will not slide easily through the valve guide, remove any slight burrs on the end of the valve stem with a carborundum stone. If the burrs are not removed and the valve is forced out, the guide may be damaged.

12. Removal of Rockers

To remove the rocker, first take off the cylinder head. Remove the hexagon plug on the inner side and the rocker spindle may be drawn out by means of a bolt screwed into the rocker spindle, which is tapped $\frac{5}{16}$" B.S.F.

On re-assembling make sure that the spring washers are fitted on the sides of the rockers nearest the centre of the engine and the plain thrust washers on the outer sides.

13. Removal of Valve Guides

To remove the valve guides from the heads two special tools are required which can easily be made.

The first is a piece of tube with an internal bore of not less than $\frac{7}{8}$ in.

The second is a mandrel about 4 in. long made from $\frac{9}{16}$ in. diameter bar with the end turned down to about $\frac{5}{16}$ in. diameter for $\frac{1}{2}$ in.

Support the cylinder head on the tube which fits over the collar of the valve guide. Using the mandrel force the guide out of the head with a hand press or by using a hammer.

To fit a new guide, support the head at the correct angle and use a hand press and the same mandrel. If a hand press is not available and the guide is replaced by a hammer, use a piece of tube of $\frac{9}{16}$ in. internal diameter to prevent damage to the bore of the guide. If a valve guide is removed for any reason, an oversize one should be fitted in order to maintain the interference. It is necessary to re-cut the valve seat and grind in the valve after a guide has been replaced. (See Subsection 18.)

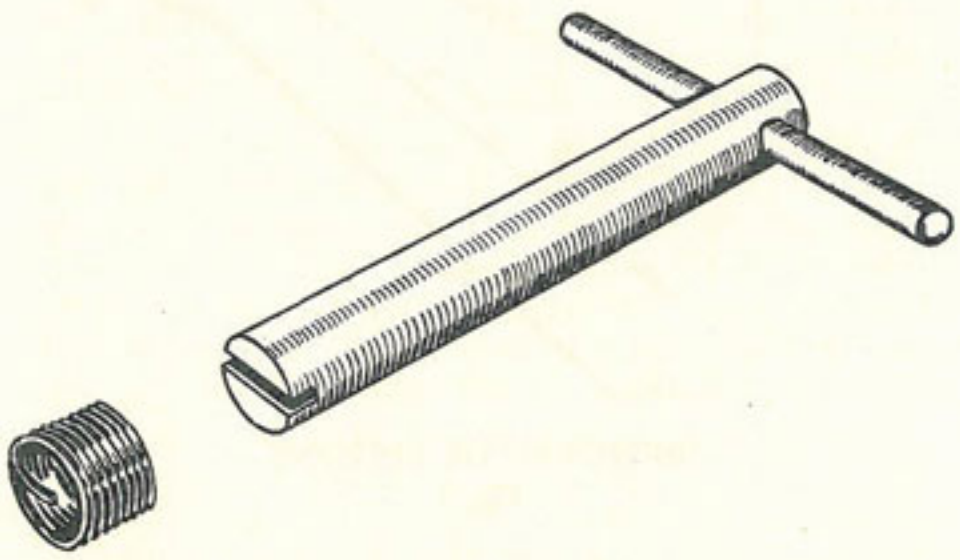
A worn exhaust valve guide may give rise to slight smoking from the exhaust pipe due to oil passing down the valve stem on to the hot valve head. This may also be caused or increased by faulty operation of the breather.

14. Renewal of Sparking Plug Inserts

A steel thread insert is fitted into each sparking plug bore to prevent damage to the threads in the alloy cylinder heads.

This insert should not normally require renewal but if it does become damaged, for instance by a faulty plug, it can be pulled out with a pair of pliers and a new one fitted.

To fit a new insert a special tool T.2142, consisting of a piece of $\frac{7}{16}$ in. diameter tube or rod with a slot cut in the end is required.



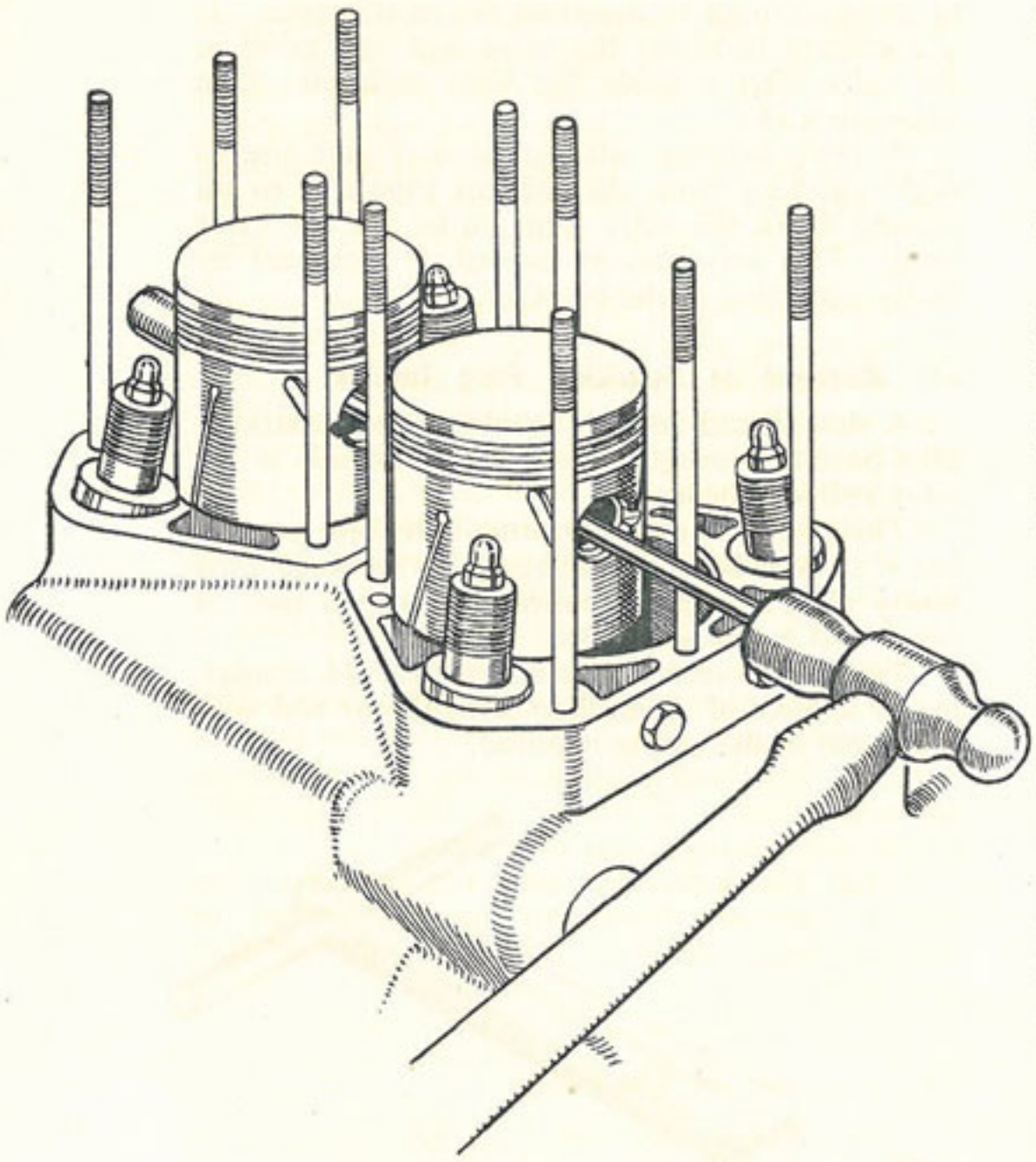
SPARKING PLUG INSERT
Fig. 6

The new insert is placed over the tool with the tag engaging in the slot and it is screwed into the plug hole in the cylinder head from the outside until the last coil is 1 to $1\frac{1}{2}$ threads below the top face. A reverse twist of the tool will then break off the tag.

If the cylinder head has not been removed from the engine, care must be taken not to drop the end of the tag into the cylinder and in such a case it is better to break off the tag with a pair of long-nosed pliers.

15. Removal of Cylinders

When the cylinder heads have been removed the cylinders can be lifted clear of the studs. This should be done with the pistons at bottom dead centre.



REMOVAL OF PISTONS
Fig. 7

When replacing the cylinders, clean off the joint faces and fit new paper joints, two to each cylinder.

16. Removal of Pistons

Remove the cylinder heads and cylinders.

With a tang of a file remove one of the wire circlips retaining the gudgeon pins. If necessary rotate the engine slightly until the pistons are in such a position that the gudgeon pins will clear the long cylinder studs when being withdrawn.

Use Special Tool No. E.5477 to extract the gudgeon pin or using a rod about $\frac{1}{4}$ in. in diameter insert this right through one gudgeon pin and drive the other pin out of its piston, supporting the connecting rod substantially meanwhile to prevent distortion.

Having lifted the first piston away, the other one may be readily removed in the same manner. Mark the pistons and gudgeon pins so that they go back into the same pistons the same way round and so that the pistons go back into the same barrels the same way round.

Take care not to drop the gudgeon pin circlip into the crankcase. A clean cloth should be put over the mouths of the crankcase to prevent this.

17. Decarbonising

Having removed the cylinder heads as described in Subsection 10, scrape away all carbon, bearing in mind that you are dealing with aluminium which is easily damaged. Scrape gently and avoid scoring the combustion chamber or the valve seats which are of austenitic iron shrunk into the head. Be careful while performing this work not to injure the joint faces which bed down on to the head gaskets.

Do not, in any circumstances, use caustic soda or potash for the removal of carbon from aluminium alloy.

Scrape away all carbon from the valve heads and beneath the heads, being very careful not to cause any damage to the valve faces.

If the piston rings are removed the grooves should be cleaned out and new rings fitted. For cleaning the grooves, a piece of discarded ring thrust into a wooden handle and filed to a chisel point is a useful tool.

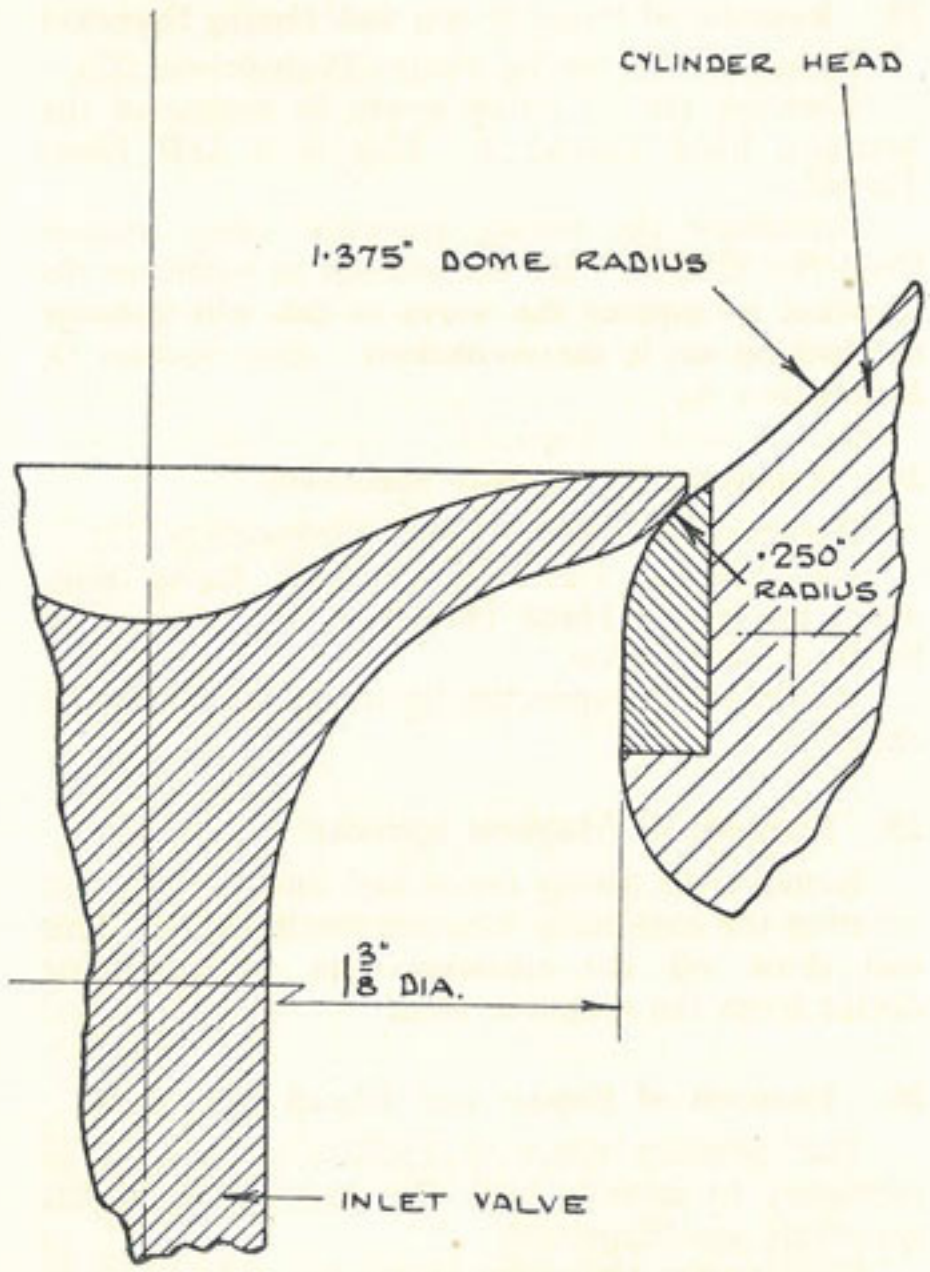
If the piston ring gaps exceed $\frac{1}{16}$ in. when the rings are in position in the barrel, new rings should be fitted. The correct gap for new rings is ·011—·015 in. The gap should be measured in the least worn part of the cylinder, which will be found to be the extreme top or bottom of the bore.

While the cylinders and pistons are not in position on the engine, cover the crankcase with a clean cloth to prevent the ingress of dust and dirt of all kinds. Do not, of course, attempt to scrape the carbon from the pistons when the mouths of the crankcase are open.

18. Grinding-in Valves

To grind a valve, smear the seating with a little grinding-in compound, place a light, short coil spring over the valve stem and beneath the head, insert the valve into its appropriate guide, press it on to the seat using a tool with a suction cup and with a backwards and forwards rotary motion, grind it on to its seat. Alternatively, a tool which pulls on the valve stem can be used. Frequently lift the valve and move it round so that an even and true seating is obtained. If no light spring is available, the lifting will have to be done by hand. Continue grinding until a bright ring is visible on both valve and seating.

The faces and seats of the exhaust valves are cut at 45 degrees but the profiles of the inlet valves are of a special streamlined design which



INLET VALVE SEAT PROFILE
Fig. 8

eliminates pockets and sharp edges and allows a smooth flow of gas without eddies.

If the inlet valves or their seats are pitted and require re-cutting, care must be taken to reproduce the correct profile as shown in Fig. 8.

The cylinder heads should preferably be returned to the works for the inlet valve seats to be re-cut, but, if this is not possible, a special tool consisting of an arbor No. T 2053 and cutter No. T 2054 is available. Great care must be exercised in using this tool, as it is located off the valve guides and these may be damaged if suitable apparatus is not employed.

The inlet valve faces and seats can be cut at 45 degrees in cases of expediency but this may have a deleterious effect on the performance of the engine.

19. Re-Assembly after Decarbonising

Before building up the engine, see that all parts are scrupulously clean and place them conveniently to hand on a clean sheet of brown paper.

It is advisable to fit new gaskets to the cylinder base and cylinder head. Two paper gaskets are fitted to the base of each cylinder.

Smear clean oil over the pistons, having replaced the rings if these have been removed, lower the piston over the connecting rod and insert the gudgeon pin from the outer side. Fit the circlip and then fit the second piston in a similar manner.

Check the piston ring gaps to find out whether excessive wear has taken place (see Subsection 17).

Oil the cylinder bores and lower the barrels over the pistons and seat them gently on their gaskets.

Drop the push rods down their tunnels on to the tappet heads, shallow cups upwards.

Fit the copper cylinder head gaskets and see that the dowels are in position.

Replace the cylinder heads as described in Subsection 10.

After the engine has been assembled, run it for a brief period at a speed which will ensure that the ignition has been advanced by the automatic advance device. If it is run too slowly ''blueing'' of the exhaust pipes may take place.

After the engine has been run for some time and has become thoroughly hot, go over **all** the cylinder head and other nuts to ensure that they are tight.

20. Cleaning the Oil Filters

The oil filter is located in the timing cover immediately below the oil pumps and is in the feed circuit to the big ends.

The filter element is removed by unscrewing the nut holding the end cap in position. When re-assembling the filter after cleaning, take care that no grit or other foreign matter is sticking to it. The aluminium cylinder fitted over the rod inside the filter element is to reduce the free space which has to be filled after cleaning before oil reaches the big ends. After emptying the filter chamber it is essential to run the engine slowly for about five minutes to ensure that oil is reaching the big ends.

The felt element should be taken out and washed in petrol after the first 500 miles and after every subsequent 2,000 miles. Fit a new element every 5,000 miles.

21. Overhaul of Oil Pumps

Remove the timing cover as described in Subsection 1.

Remove the end plates from both pumps.

Remove the pump discs and plungers.

Remove the pump spindle which can be pulled out from the front or return pump end.

Check the fit of the plungers in the pump discs which should have a minimum of clearance but should be able to be moved in and out by hand.

If, when fitting a new disc or plunger, the plunger is found to be too tight a fit, carefully lap with metal polish until it is just free. If the pump disc is not seating properly or if a new pump disc is being fitted, it should be lapped to the seating with Special Tool No. E.5425, using Carborundum 360 Fine Paste or liquid metal polish until an even grey surface is obtained.

Wash all passages, etc., thoroughly with petrol after lapping to remove all traces of grinding paste.

The feed pump spring is stronger than that in the return pump and care must be taken to see that they are not interchanged. The feed pump is at the rear or on the right-hand side looking on the timing cover.

Check the pump disc springs for fatigue by assembling in the timing cover and placing the pump covers in position. If the springs are correct, the pump cover should held $\frac{1}{4}$ in. off the timing cover by the feed pump spring and $\frac{1}{8}$ in. off by the return pump spring.

The pump spindle should be renewed if excessive wear has taken place on the teeth.

Re-assemble the oil pumps, replacing the paper cover gaskets if necessary. Before fitting each cover fill the pump chamber with clean oil.

Having assembled the pumps, lay the timing cover flat and fill the oil ports by means of an oilcan. Turn the pump spindle with a screw driver in a clockwise direction looking on the front and it can then be seen whether the pumps are operating correctly.

Fill the filter chamber with clean oil and replace the timing cover, taking great care not to damage the gasket where the section is narrow.

When the timing cover has been refitted on the engine, the oil feed to the big ends can be checked by partially unscrewing the feed plug in the timing cover between the oil pumps. The oil return to the tank can be checked by removing the oil filler cap. The feed to the rockers can be observed by removing the rocker-box covers, when oil will be seen flowing down the surface of the push rods.

22. Removal of Timing Chains

Loosen the magneto fixing bolts.

Remove the magneto sprocket (Subsection 4).

Lift the magneto chain off the cam sprocket.

Loosen the chain tensioner locknut and stud.

Lift the adjusting plate clear of the chain tensioner spindle.

Remove the chain tensioner spindle and sprocket.

Lift the chain off the sprockets.

23. Removal of Pump Worm and Timing Sprocket

Remove the timing chains (Subsection 22).

Unscrew the oil pump worm by means of the hexagon head behind it. This is a **Left Hand Thread.**

Withdraw the timing sprocket using Special Tool No. E.4869. **Do not attempt to withdraw the sprocket by tapping the worm as this will dislodge the locking nut in the crankshaft.** (See Section D, Subsection 6.)

24. Removal of Camshaft Sprockets

Remove the timing chains (Subsection 22).

Unscrew the camshaft sprocket fixing bolt, **which has a Left Hand Thread,** at the same time holding the sprocket.

Withdraw the sprocket by means of a suitable extractor.

25. Removal of Magneto Sprocket

Remove the timing cover and unscrew the nut securing the automatic advance mechanism. This will draw off the sprocket and auto-advance device from the magneto shaft.

26. Removal of Engine and Clutch Sprockets.

The primary chain is endless so that it is necessary to remove both the engine and clutch sprockets simultaneously.

Remove the alternator stator by undoing three fixing screws.

Remove the central hexagon nut securing the alternator rotor, which can then be drawn off, taking care not to lose the key.

Unscrew the engine sprocket nut using Special Tool No. E.4877. The engine sprocket is mounted on splines and can then be removed with the clutch sprocket.

To remove the clutch sprocket unscrew the three clutch spring pins then lift away the spring cap, springs and distance pieces, clutch front plate, centre retaining ring and the assembly of driving and driven clutch plates. The clutch sprocket can then be withdrawn from the centre after removal of the large circlip which secures it.

When replacing the engine sprocket, take care that the felt washer is not nipped behind the sprocket. This would make the engine very stiff to turn over and would damage the washer and allow leakage from the crankcase.

27. Removal of Tappets and Guides

It is only necessary to remove the tappets and guides if they have become worn.

Remove the cylinder heads and barrels. (Subsections 10 and 15).

Extract the tappet guides, using Special Tool No. E.5790, having heated the case first.

The guides are made from Nickel Chrome Alloy Iron and if a guide should break while removing it, it can be withdrawn with a pair of pliers if the crankcase is heated locally with a blowlamp. Otherwise it is necessary to dismantle the crankcase and drive the tappet and guide out from underneath using a heavy bar in the cam tunnel.

The guide should have an interference of ·0015 to ·0025 in. in the crankcase and can be driven in with a bronze drift, care being taken when the guide is nearly home to avoid breaking the collar.

If a tappet guide is taken out it should be replaced by an oversize one.

28. Dismantling the Breather

If the breather is not operating efficiently, it may cause pressure in the crankcase, instead of a partial vacuum, giving rise to smoking or over-oiling.

See that the discs and backplate are clean and undamaged and that the discs are seating properly.

When re-assembling the breather, apply jointing compound sparingly to the back of the steel plate taking great care to keep it away from the discs or their seatings.

29. Removal of Clutch

Remove the engine sprocket and clutch sprocket together as described in Subsection 26.

To remove the clutch hub, hold the clutch with Special Tool No. E 4871 and remove the centre retaining nut and washer with a box spanner.

The hub can then be withdrawn from the shaft with Special Tool No. E.5414.

30. Removal of Final Drive Sprocket

Remove the clutch as described in Subsection 29.

Remove the primary chain tensioner.

Remove the rear half of the primary chain case by taking out three socket screws.

Remove the grub screw locking the final drive sprocket nut.

Hold the sprocket and remove the nut (**Right Hand Thread**). The sprocket can then be withdrawn.

31. Removal of Bearing Housing Felt Washer

Remove the engine sprocket, clutch and rear half of the primary chain case.

The felt washer is located in the steel housing at the back of the chain case.

Great care must be taken not to nip the felt washer behind the sprocket on re-assembly as this would make the engine very stiff to turn over and would damage the washer and allow leakage from the crankcase.

32. Oil Pipe Unions

The oil feed to the rocker gear is through pipes from unions at the back of the crankcase below the cylinder base to unions on the cylinder heads. The unions are fitted with steel wire thread inserts to prevent the threads in the aluminium from stripping.

The method of fitting the thread inserts is the same as that used for the sparking plug inserts described in Subsection 14.

33. Rocker Oil Feed Relief Valves

There is a pressure relief valve in the oil supply to the rocker gear, whose function is to prevent excessive pressure and whose setting is not critical.

The valve is located in the crankcase face behind the timing cover and consists of a $\frac{3}{16}$ in. diameter steel ball held in position by a spring and a brass plug.

The valve is set before leaving the Works and should not normally require to be disturbed but, if it is found necessary to dismantle it, it can be reset by screwing the plug in until it is flush with the face of the crankcase, which will cause the pressure to be relieved at approximately 10 lbs. per square inch. The plug is prevented from moving by peening over the aluminium into the screw-driver slot with a small centre punch.

34. Fitting the Alternator

The alternator consists of two parts, the stator and the rotor. The stator is mounted on the back half of the primary chaincase, being held in position by three studs and distance pieces. The rotor, which contains the permanent magnets is mounted by means of an adaptor on the end of the crankshaft and is secured by a stud and nut and located by a key.

The radial air gap between the rotor and the poles of the stator should be ·020 in. in all positions and care must be taken when re-fitting to see that it is not less than ·010 in. at any point.

Fit the rotor first, making sure that it is located concentrically on the end of the crankshaft. Attention must be given to the seating of the key because a badly-fitting key may cause the rotor to run unevenly. The nut holding the rotor in position is secured by a tab washer.

Having fitted the rotor, place the three distance collars over the three studs in the primary chain-

case and put the stator in position with the coil connections facing outwards.

Replace the nuts and shakeproof washers only finger-tight and insert six strips (preferably of non-magnetic material) ·015 in. thick and about $\frac{1}{8}$ in. wide between the rotor and each pole piece.

Tighten the stator nuts and withdraw the strips.

Check the air gap with narrow feelers and, if less than ·010 in. at any point, remove the stator and file or grind the pole piece carefully until the correct gap is obtained.

An alternative, and more satisfactory, method of assembling the alternator requires the use of Special Tool No. T2055.

This is a gauge ·015 in. greater in radius than the rotor and fits over the adaptor on the end of the crankshaft in the rotor's place.

The stator is then put in position on the studs in the chaincase and the nuts tightened up.

Remove the gauge and fit the rotor, then check the air gap.

35. Removal of the Magneto

The magneto is bolted to the timing side crankcase by the hexagon-headed screws. Access to these is obtained by removing the timing cover (Subsection 1) and the magneto sprocket and automatic advance device (Subsection 25).

SECTION D4

Service Operations with Engine Removed

"Super Meteor"

1. Removal of the Engine from the Frame

Disconnect the battery leads.

Remove the dual seat and petrol tank.

Remove the engine steady.

Remove the tool box cover and slide the flexible connection to the air cleaner off the induction pipe.

Remove the exhaust pipe.

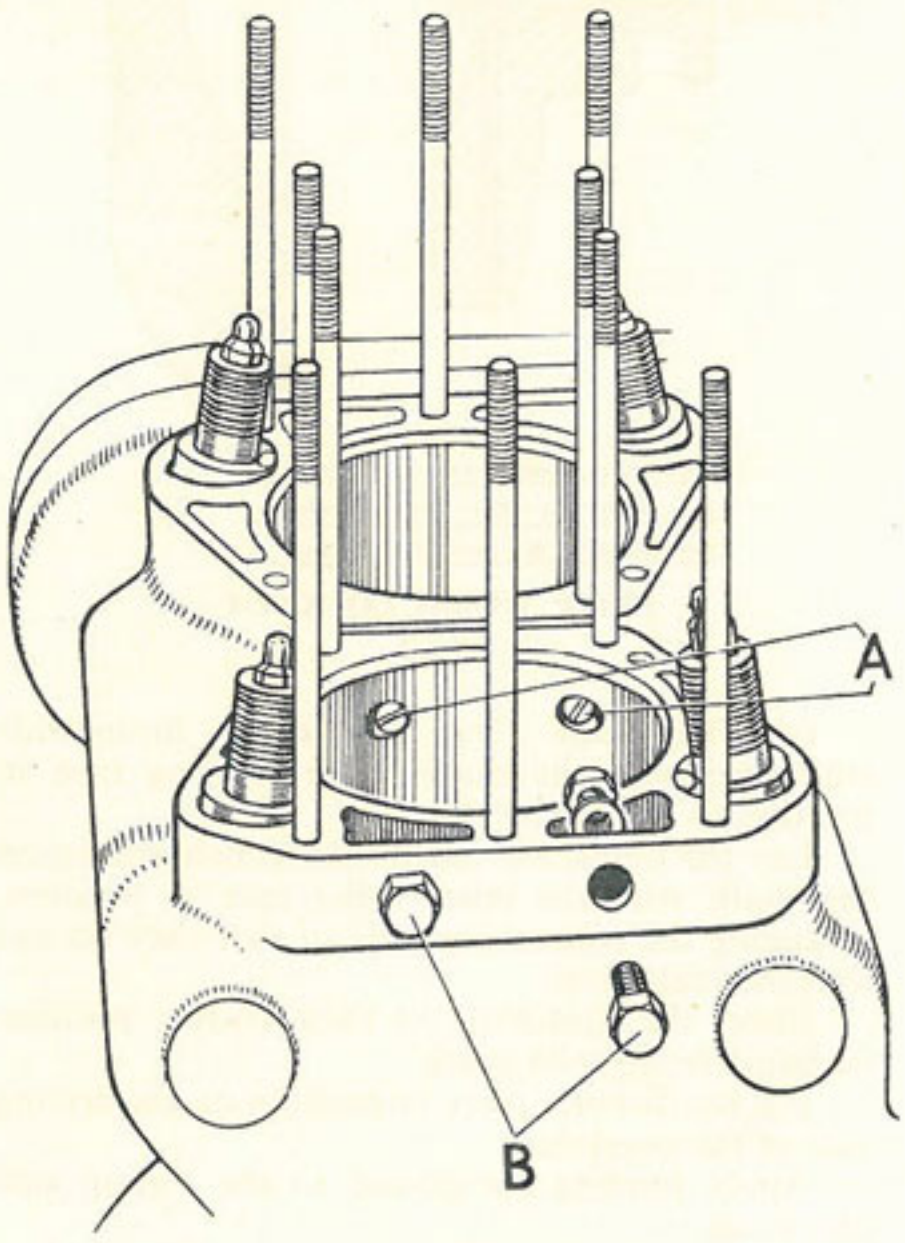
Disconnect the electric horn leads.

Disconnect the alternator leads from rectifier and swing the rectifier clear.

Disconnect the magneto cut-out lead.

Remove the slides from the carburettor.

Remove the rear chain.



REMOVAL OF SCREWS IN CRANKCASE
Fig. 1

Remove the footrest bar.

Remove the bottom rear engine bolt.

Support the engine on a suitable box or wood block.

Raise the centre stand and remove the spring.

Loosen the bottom gearbox nuts and swing the lower engine plates down.

Remove the front engine plates and horn stand.

Lift the engine out of the frame.

2. Removal of the Gear Box

Remove the engine sprocket and clutch (Section C., Subsections 26 and 29).

Remove the rear half of the primary chaincase by removing three socket screws and the chain tensioner pivot.

The gearbox can now be withdrawn from the back of the crankcase after unscrewing the four nuts which secure it.

3. Dismantling the Crankcase

Drain the oil tank by removing the drain plug.

Having removed the engine from the frame as described in Subsection 1, dismantle the heads, barrels, pistons, timing gear, magneto, etc., as described in Section C4.

Remove the gearbox as described in Subsection 2.

Remove the two hexagon-headed plugs on the driving side of the crankcase just below the cylinder base. (On no account must these plugs be disturbed unless the driving side cylinder has been or is to be lifted because they cannot be tightened without holding the nuts inside.)

Access can now be obtained through the plug holes to two screws holding the two halves of the crankcase together which must be removed.

Remove three nuts in the timing chest, two nuts on the driving side crankcase, two loose studs through the bottom of the crankcase and two loose studs through the back of the oil tank. (The other studs have already been removed to take the engine out of the frame.)

Turn the crankshaft until the connecting rods are at bottom dead centre and the two halves of the crankcase can then be separated, tapping the crankcase with a soft mallet.

The inner race of the roller bearings on the timing side will remain on the crankshaft bringing with it the cage and rollers and leaving the outer race fixed to the crankcase.

The inner race of the ball bearing on the driving side is a tight fit on the shaft and can be removed with Special Tool No. E.5121. If this is not available, the shaft can be driven out with a hide mallet or a soft metal drift.

To avoid damage to the ball bearing the case should be heated to about 100°C. before doing this.

4. Main Bearings

To remove the ball bearings from the driving side crankcase, heat the crankcase to about 100 degrees C. by immersion in hot water or in an oven after which the bearings can be driven out using a drift **which applies pressure to the outside race only.**

When refitting a new ball bearing, heat the crankcase in the same way and use the same drift taking great care to keep the bearing square with the bore.

To remove the outer roller race from the timing side crankcase, first heat the crankcase then drive the race out using a small punch through the three holes provided.

The inner race and rollers can be withdrawn from the crankshaft using a claw type extractor.

When refitting the inner race drive it on to the shaft until just flush with the end and no further.

5. Fitting the Connecting Rods

To remove the connecting rods from the crankshaft, first take out the cotter pins securing the socket screws in the connecting rods and then remove the socket screws themselves.

If the big end bearings caps are removed to examine the condition of the bearings, *make sure that the caps are refitted the same way round on the same rods and that the rods themselves are refitted the same way round on the same crank pins.*

In refitting the connecting rods, the socket screws should be tightened with a torque wrench set at 200—220 inch-lbs.

If the cotter pins do not come in line remove the socket screws and use a different thickness of washer. A difference of ·005 in. in the washer alters the position of the screw approximately $\frac{1}{8}$ of a turn.

There is a recess in one side of the connecting rod for a cotter pin head and this side must face outwards when the connecting rod is assembled on the crankshaft to avoid fouling between the cotter and the crankshaft web.

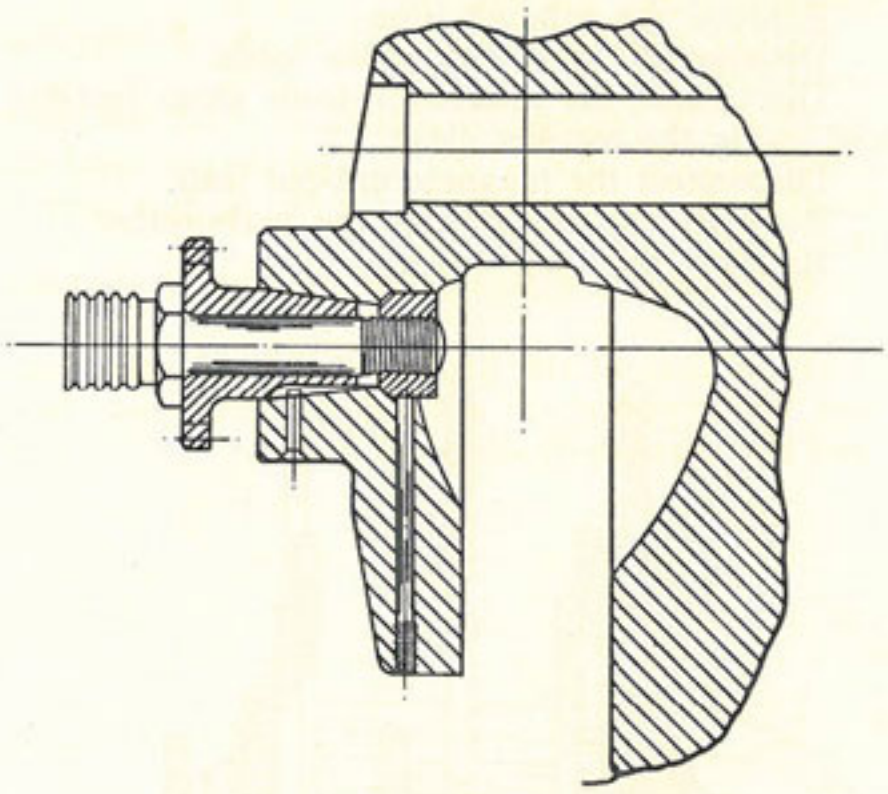
If it is necessary to replace the big ends, a service crankshaft can be supplied with connecting rods fitted.

6. Re-assembly of the Crankcase

Fit the outer roller race in the timing side crankcase, the ball-bearing in the driving side crankcase and the inner roller race on the crankshaft as described in Subsection 4.

Be sure that the inner race is driven on just flush with the end of the crankshaft and no further.

There are several methods of assembling the crankcase. If the timing-side is fitted to the crankshaft first, care must be taken not to score the inside of the case. If the driving-side is fitted first it is possible, with some makes of roller bearing, though not probable, to drop one of the rollers into the crankcase and cause serious damage to the engine.



SECTION SHOWING LOCKING OF OIL PUMP WORM AND TIMING SPROCKET BY LOCKING ROD.

PUMP WORM LOCKNUT
Fig. 2

(*a*) *Timing-side First.* Heat the timing-side crankcase with the outer roller bearing race in position to about 100° C.

Lay the crankcase flat on the bench and insert the shaft, with the inner roller race in position, arranging the connecting rods so that they do not foul the crankcase.

Insert the camshafts in their correct position (exhaust front, inlet rear).

Put the distance piece in position on the driving side of the crankshaft.

Apply jointing compound to the timing side crankcase.

Heat the driving-side crankcase and bearing to 100° C. and drop it over the crankshaft, *making sure to lift the tappets clear of the cams.*

Bolt the two halves of the crankcase together. The crankshaft should now be drawn into its correct position by fitting the engine sprocket temporarily and tightening the nut whilst the crankcase is still hot.

(*b*) *Driving-side First.* Support the crankshaft with the driving end pointing upwards and place the distance piece in position. Heat the driving-side crankcase to about 100° C. and place it over the crankshaft. Fit the engine sprocket and tighten the nut while the crankcase is still hot.

Invert the crankshaft and crankcase and support it on two blocks of wood or a large block with a hole in it.

Insert the camshafts in their correct position (exhaust front, inlet rear).

Apply jointing compound to the driving-side crankcase.

Heat the timing-side crankcase (with the outer roller race) to about 100° C. and drop it over the crankshaft, *making sure to lift the tappets clear of the cams.*

Bolt the two halves of the crankcase together.

If so desired the heated timing-side crankcase can be supported on a block or blocks as above and the crankshaft dropped into it.

Alternatively, the crankshaft can be supported in a vertical position as above and the crankcase driven on to it (without heating) by means of a tubular drift applied to the inner race of the bearing or the crankcase may be drawn on to the shaft by means of the sprocket nut with a temporary distance piece in place of the sprocket.

7. Pump Worm Locknut

The pump worm is held in position in the end of the crankshaft by a steel nut which is permanently fixed in the crankshaft and should not be removed.

The nut is fitted in a recess and locked by means of a long peg which in turn is held by a grub screw in the timing side crank web.

If it is necessary to re-fit the nut, assemble the timing sprocket with the pump worm and nut in the crankshaft while out of the crankcase and tighten it up.

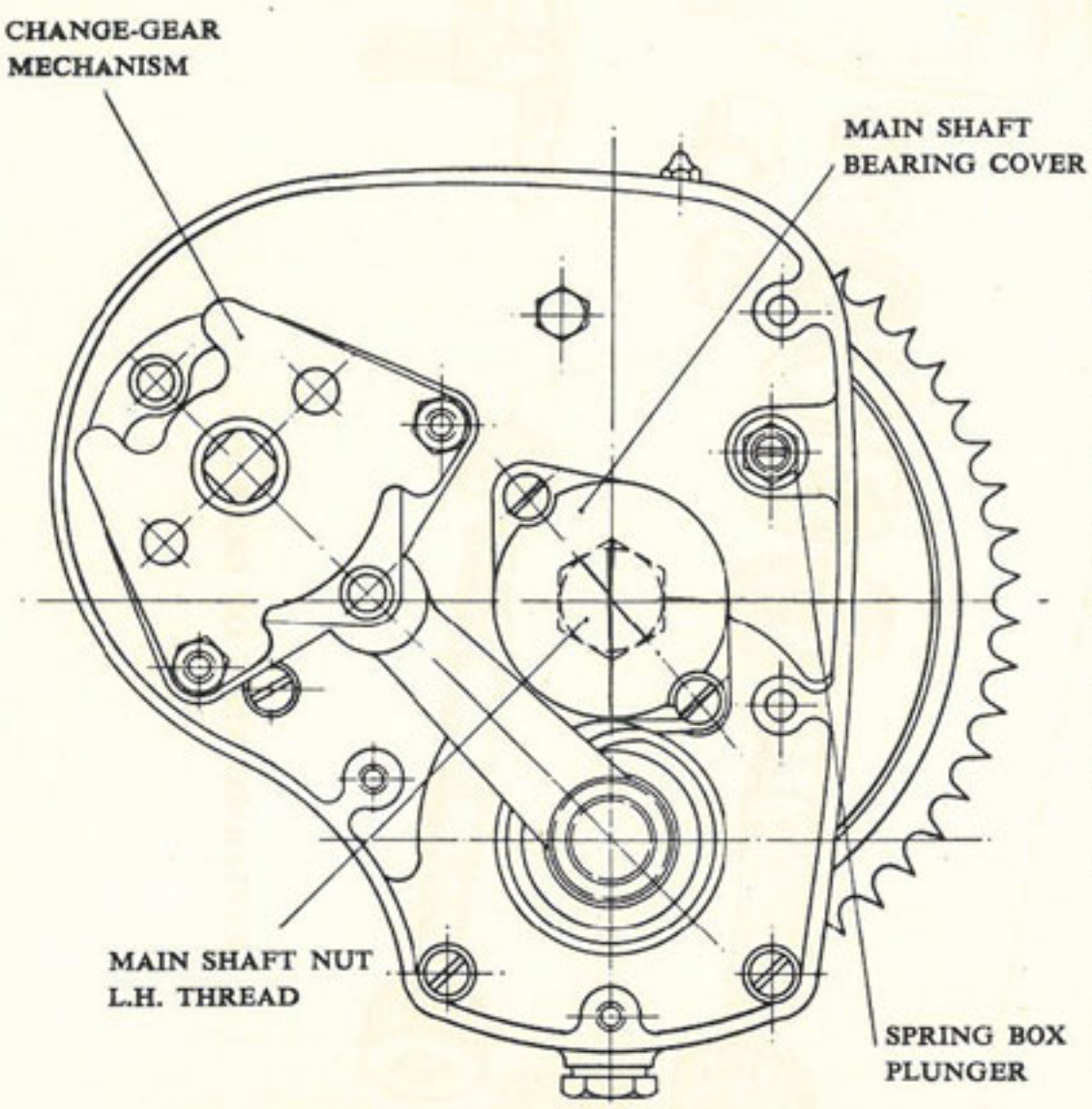
By means of a long drill through the hole in the crankshaft web, countersink the nut to about $\frac{1}{8}$ in. Insert the locking rod and grub screw.

Remove the pump worm and sprocket and re-assemble after the shaft has been fitted in the crankcase.

SECTION E4

Gearbox and Clutch

"Super Meteor"



GEARBOX WITH OUTER COVER REMOVED
Fig. 1

1. Removal of Gearbox.

This is described in Section D4, Subsection 2.

The gearbox can, however, be completely dismantled with the engine in the frame except for the removal of the inside operator and the bearings in the gearbox shell.

2. To Dismantle the Gearbox

First remove the kickstart crank, the change-gear lever and the neutral finder and pointer.

Remove the top small inspection cover and disconnect the clutch cable.

Remove four screws and the gearbox outer cover can then be detached.

Remove the change-gear mechanism by taking off the two nuts securing it.

Remove the main shaft bearing cover which is attached by two screws.

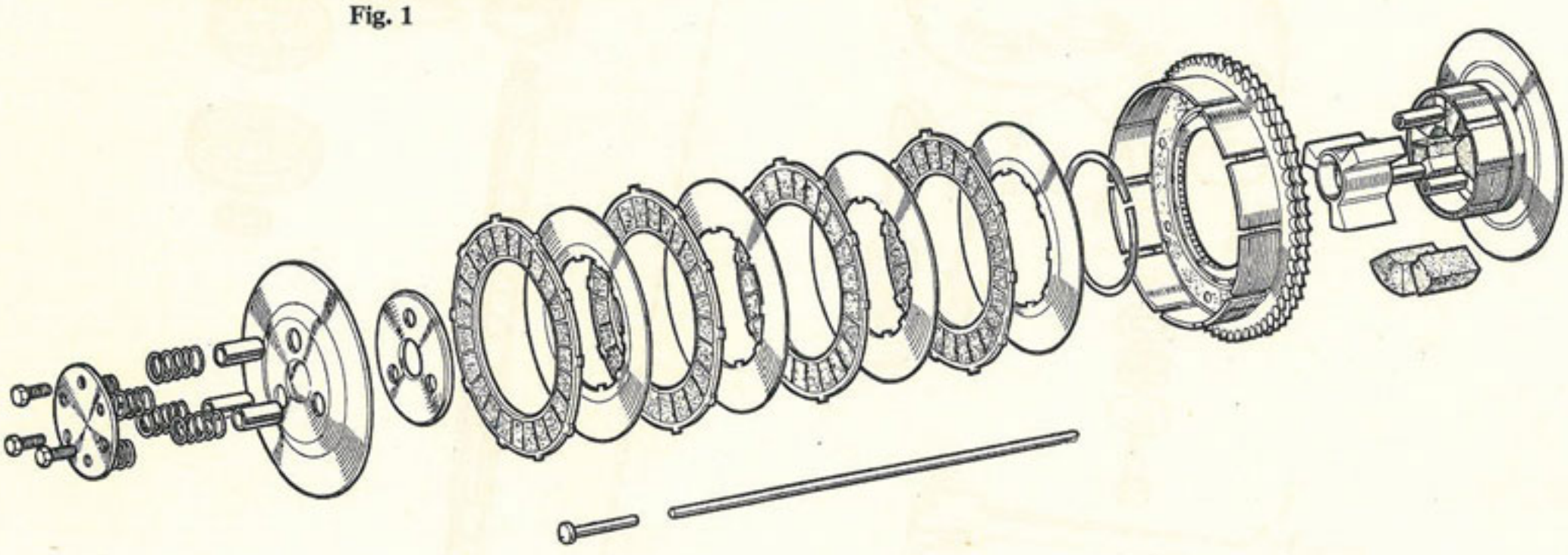
Remove four cheese-headed screws and one hexagon bolt.

Remove the spring box locating plunger nut and washer.

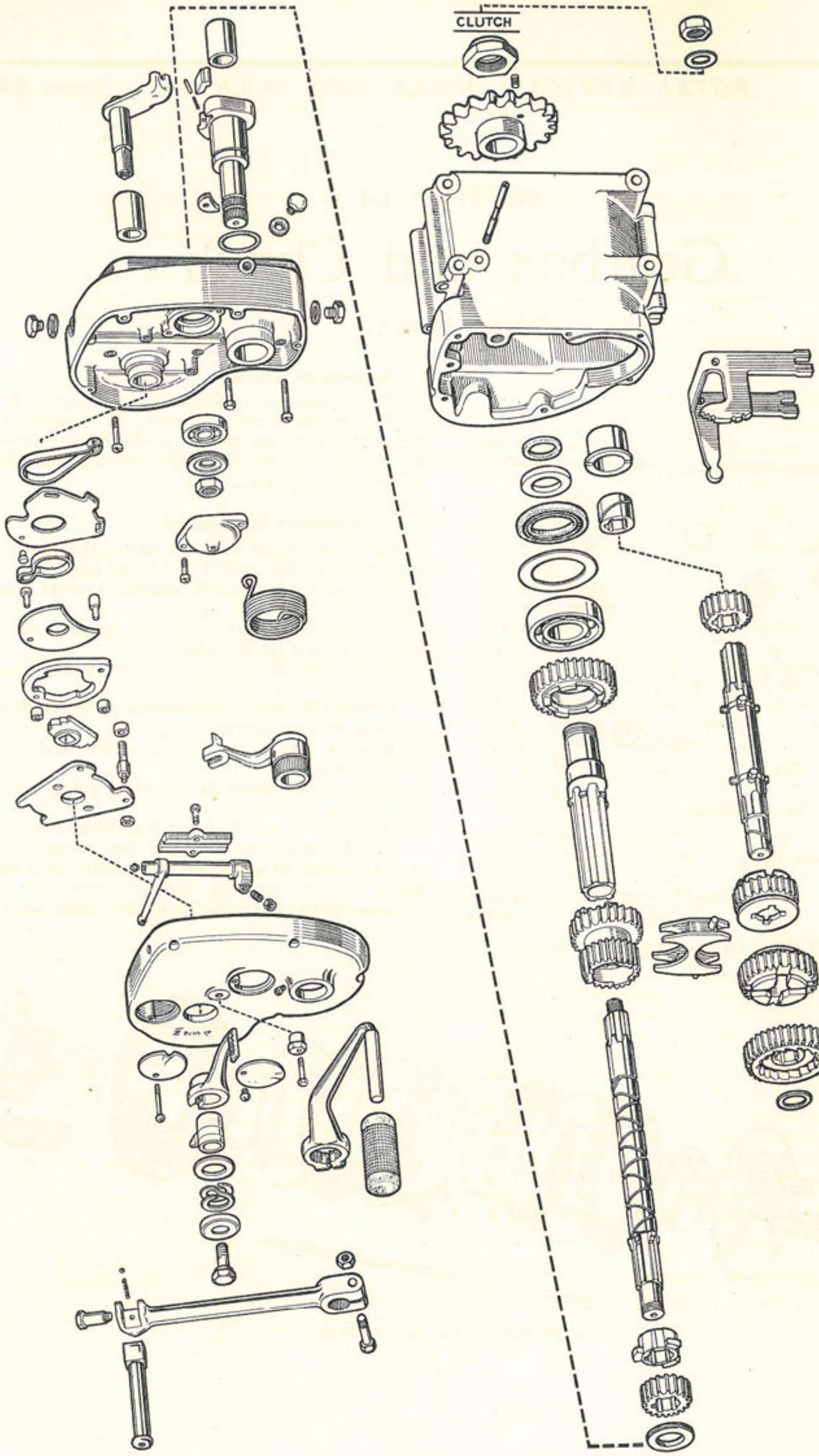
Remove the main shaft nut **(Left Hand Thread).**

The gearbox inner cover can then be removed.

The mainshaft can be drawn straight out if the clutch has been removed, which, however, should be done before taking off the gearbox inner cover.



EXPLODED VIEW OF CLUTCH
Fig. 2



EXPLODED VIEW OF GEARBOX
Fig. 3

(See Section C4.) The top gear pinion and dog will come away with the mainshaft.

The layshaft can then be removed and the 2nd and 3rd gears drawn off the final drive sleeve together with the operator fork.

To take out the final drive sleeve, the final drive sprocket must be removed and this is preferably done before removing the inner cover. (See Section C4.)

3. Removal of the Ball Races

The mainshaft ball bearings can be removed by using a stepped drift $1\frac{7}{16}$—$1\frac{11}{64}$ in. diameter for the bearing in the box and $\frac{13}{16}$—$\frac{29}{64}$ in. diameter for the bearing in the cover.

When refitting the bearings stepped drifts of $2\frac{5}{16}$—$1\frac{11}{64}$ in. diameter and $1\frac{11}{16}$—$\frac{39}{64}$ in. diameter must be used for the bearings in the box and cover respectively.

Note the felt washer in the recess behind the larger main shaft bearing and the dished pen-steel washer between the bearing and the felt washer. The second dished pen-steel washer, if fitted, has a smaller central hole and is on the other side of the main shaft bearing and is nipped between the inner face of the bearing and the shoulder on the final drive sleeve. See that both of the dished pen-steel washers have their raised portions facing towards the clutch and final drive sprockets.

4. Change-Gear Mechanism

If the two nuts securing the change-gear ratchet mechanism are slackened the adjuster plate can be set in the correct position. In this position the movement of the gear lever necessary to engage the ratchet teeth will be approximately the same in each direction.

If the plate is incorrectly adjusted, it may be found that, after moving from top to third or from bottom to second gear, the outer ratchets do not engage the teeth on the inner ratchets correctly.

If, when fitting new parts, it is found that the gears do not engage properly, ascertain whether a little more movement is required or whether there is too much movement so that the gear slips right through second or third gear into neutral. If more movement is required, this can be obtained by filing the adjuster plate very slightly at the points of contact with the pegs on the ratchet ring.

If too much movement is already present, a new adjuster plate giving less movement must be fitted.

5. Re-Assembling the Gearbox

The procedure is the reverse of that given in Subsection 2, but the following points should be noted :—

If the main shaft top gear pinion and dog have been removed, make sure that the dog is replaced the right way round or third and top gears can be engaged simultaneously.

Make sure that the trunnions on the operator fork engage with the slots in the inside operator.

See that the main shaft is pushed right home. It may tighten in the felt washer inside the final drive shaft nut.

The layshaft top gear and kickstarter pinion should be assembled on the layshaft and the kick-starter shaft and ratchet assembled on to it before fitting the end cover. Do not forget the washer on the the layshaft between the kickstarter pinion and the kickstarter shaft.

The joint between the gearbox and the inner cover should be made with gold size, shellac or a similar jointing compound.

Make sure that all parts are clean before commencing assembly. In normal climates the recesses in the gearbox should be packed with soft grease and the box should be filled up to the correct level with engine oil. (See Subsection 9.) **On no account must heavy yellow grease be used.**

6. Dismantling and Re-Assembling of the Clutch

The method of removing the clutch is described in Section C4.

When re-assembling, note that two of the steel plates are dished and that other(s) are flat. The correct order of assembly is shown on the exploded drawing.

Do not forget to replace the cush rubber or plate retaining cover before fitting the pressure plate.

Make sure that the distance tubes inside three of the springs pass through the holes in the pressure plate. The other three springs are located by means of bosses on the clutch cap.

Tighten the spring pins as far as they will go.

If the clutch lifts unevenly it is probable that one of the springs has taken a set, in which case new springs should be fitted.

7. Adjustment of the Clutch Control

It is essential that there should be about $\frac{1}{16}$ in. free movement in the clutch cable, to ensure that all the spring pressure is exerted on the plates.

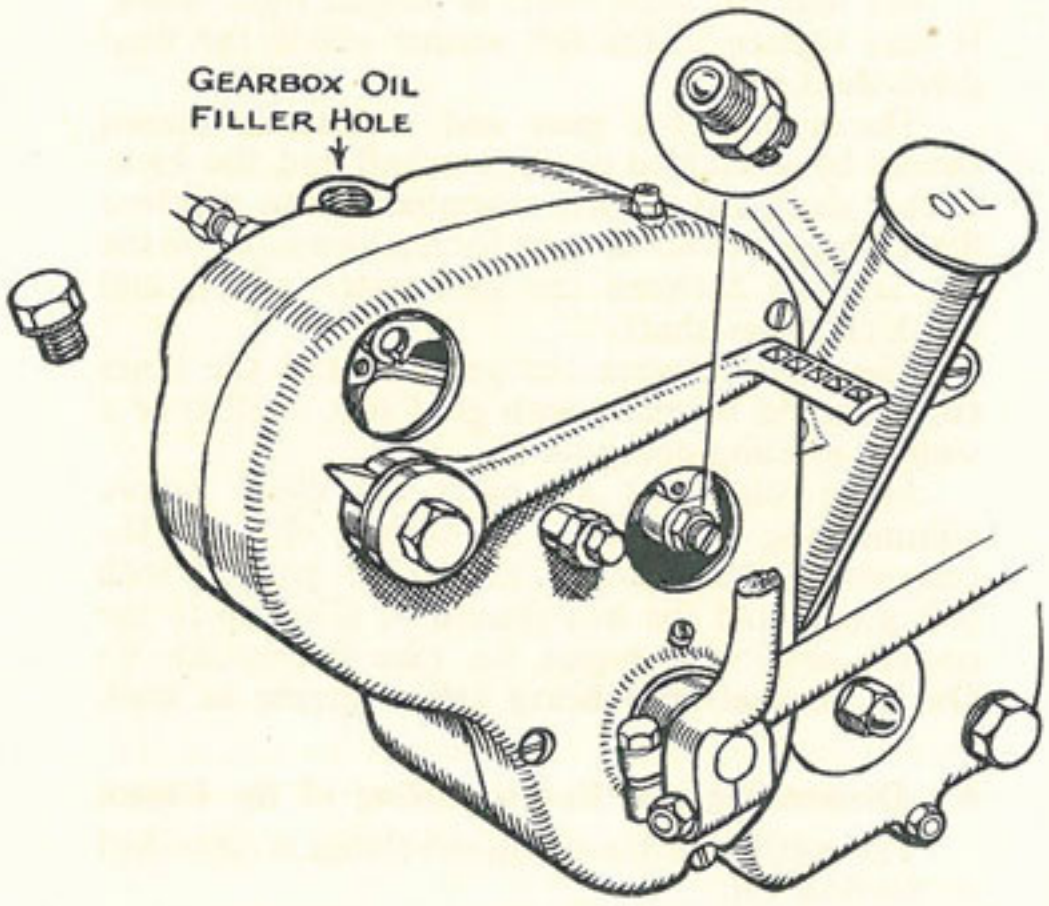
There are two points of adjustment for the clutch cable. The first is at the top of the gear-box just behind the oil filler plug and is provided for taking up any stretch in the cable. The adjustment is made by screwing the collar in or out of the gearbox shell. The connection between the end of the cable and the horizontal lever can be seen if the top small inspection cover on the front of the gearbox is removed. Tighten the locknut

on the screwed collar after adjustment has been made.

The other point of adjustment is behind the lower inspection cover on the front of the gearbox and is for compensating for wear on the clutch plate inserts. To make the adjustment, remove the inspection cover, slacken the locknut and turn the central screw. Tighten the locknut after adjustment has been made.

The reason for the two points of adjustment is to enable the lever and fork behind the cover to be kept in their proper positions whether the need for adjustment is caused by plate wear or cable stretch.

Owing to initial bedding down of the clutch plate inserts, the clutch control may require adjustment after the first few hundred miles with a new machine. This point should therefore be examined soon after delivery and adjustment made if necessary.



CLUTCH ADJUSTMENT
Fig. 4

8. Adjustment of the Neutral Finder

The neutral finder is adjusted by means of an eccentric stop secured to the front of the gearbox cover by a bolt which limits the travel of the operating pedal. Slacken the bolt and turn the eccentric until the correct movement of the pedal is obtained.

9. Gearbox Oil Level

The gearbox is filled with oil by removing a plug in the top and the correct level can be checked by removing a second plug lower down on the right hand side looking at the cover.

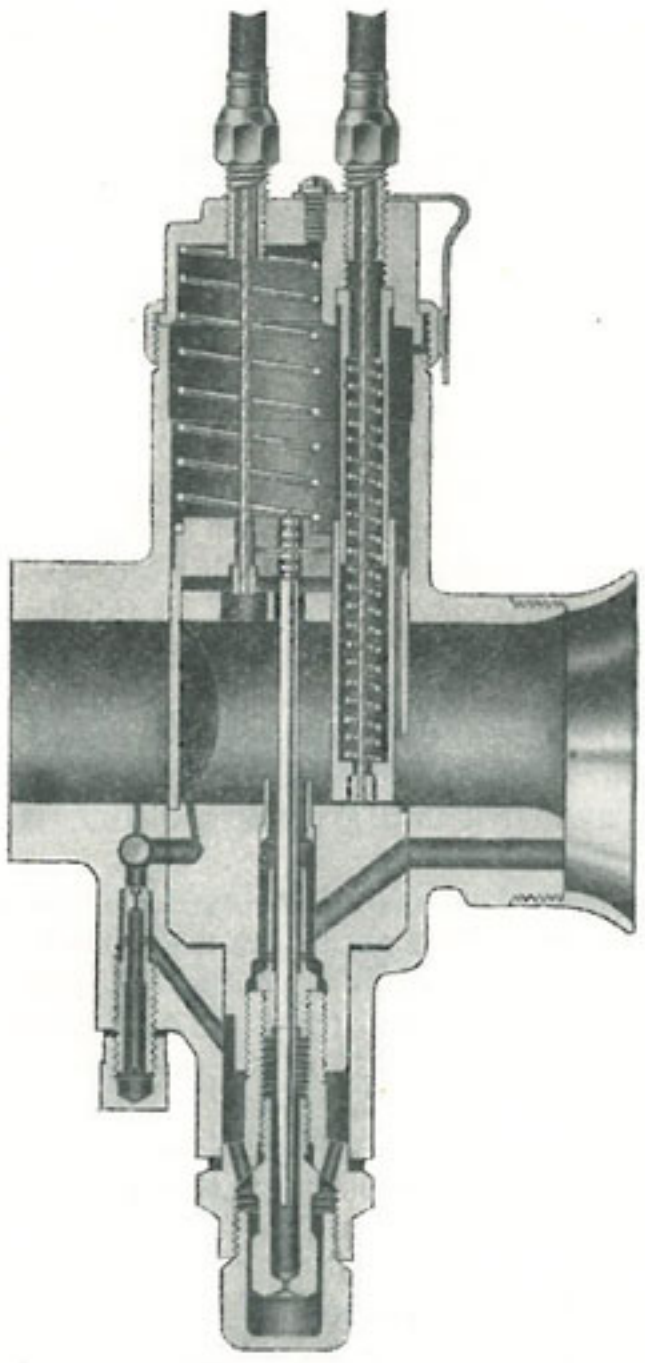
SECTION F2/59

Amal Monobloc Carburetter

1. General Description

The Amal Monobloc Carburetter has been introduced as an improvement on the earlier standard needle type. In general it gives better petrol consumption, combined with improved starting and acceleration from low speeds and a small increase in maximum speed.

The float chamber is integral with the mixing chamber and contains a pivoted barrel-shaped float operating on a nylon fuel needle. There is a considerable leverage ratio between the float and the needle and, in consequence, flooding is rare unless there is dirt on the needle seating.



SECTION THROUGH MIXING CHAMBER, SHOWING AIR VALVE AND THROTTLE CLOSED
Fig. 1

The supply of air to the engine is controlled by a throttle slide which carries a taper needle operating in the needle jet. The needle is secured to the throttle slide by a spring clip fitting in one of five grooves and the mixture strength throughout a large proportion of the throttle range is controlled by the position of this needle in the slide and by the size of the jet in which it works. There is, however, a restricting or main jet at the bottom of the needle jet and the size of this controls the mixture strength at the largest throttle openings. At very small throttle openings petrol and air are fed to the engine through a separate pilot system, which has an outlet at the engine side of the throttle. The air supply to this pilot system is controlled by the pilot air screw and the slow running of the engine can be adjusted by means of this screw and a stop which holds the throttle open a very small amount. The throttle slide is cut away at the back and the shape of this cut-away controls the mixture at throttle openings slightly wider than that required for slow running. There is a compensating system to prevent undue enriching of the mixture with increasing engine speed, this system consisting of a primary choke surrounding the upper end of the needle jet through which air is drawn in increasing quantities as the depression in the main choke increases. This air supply and the supply to the pilot system are taken from two separate ducts in the main air intake to the carburetter so that all the air passing to the engine can be filtered by fitting an air cleaner to the main carburetter air intake.

Two small cross holes in the needle jet, at a level just below the static level in the float chamber, permit petrol to flow into the primary choke when the engine is not running or when it is running at very low speeds, thus forming a well of petrol which will be drawn into the engine on starting or accelerating from low speeds. At moderately high engine speeds the level of petrol in the float chamber falls slightly and in consequence no more fuel flows through the cross holes in the needle jet so that the petrol well remains empty until the engine slows down or stops.

A handlebar controlled air slide is provided to enrich the mixture temporarily when required.

2. Tuning the Carburetter

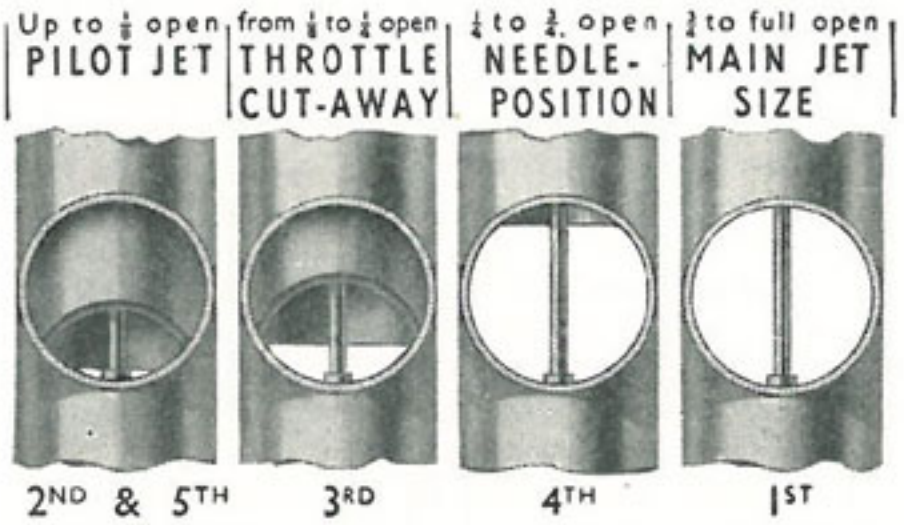
The throttle opening at which each tuning point is most effective is shown in Fig. 2. It should be remembered, however, that a change of setting at

any point will have some effect on the setting required at other points ; for instance, a change of main jet will have some effect on the mixture strength at half throttle which, however, is mainly controlled by the needle position. Similarly an alteration to the throttle cut-away may affect both the needle position required and the adjustment of the pilot air screw. For this reason it is necessary to tune the carburetter in a definite sequence, which is as follows :—

First—Main Jet. The size should be chosen which gives maximum speed at full throttle with the air control wide open. If two different sizes of jet give the same speed the larger should be chosen for safety as it is dangerous to run with too weak a mixture at full throttle.

Second—The pilot air screw should be set to give good idling. Note that the pilot jet is detachable and two sizes are available, 25 c.c. and 30 c.c. If the pilot air adjusting screw requires to be screwed out less than half a turn the larger size pilot jet should be used ; if the air screw requires to be screwed out more than 2-3 turns fit the smaller size of pilot jet.

PHASES OF AMAL MONOBLOC CARBURETTER THROTTLE OPENINGS



SEQUENCE OF TUNING

Fig. 2

Third—The throttle valve should be selected with the largest amount of cut-away which will prevent spitting or misfiring when opening the throttle slowly from the idling position.

Fourth—The lowest position of the taper needle should be found consistent with good acceleration with the air slide wide open.

Fifth—The pilot air screw should be checked to improve the idling if possible. When setting the adjustment of the pilot air screw this should be done in conjunction with the throttle stop. Note that the correct setting of the air screw is the one which gives the fastest idling speed for a given position of the throttle stop. If the idling speed is then undesirably fast it can be slowed down by unscrewing the throttle stop a fraction of a turn.

It will be noted that of the four points at which adjustments are normally made, i.e., pilot air screw, throttle cut-away, needle position and main jet size, the first and third do not require changing of any parts of the carburetter. Assuming that the carburetter has the standard setting to suit the particular type of engine any small adjustments occasioned by atmospheric conditions, changes in quality of fuel, etc., can usually be covered by adjustment of the pilot air screw and raising or lowering the taper needle one notch. If, however, the machine is used at very high altitudes or with a very restricted air cleaner a smaller main jet will be necessary. The following table gives the reduction in main jet size required at different altitudes :

Altitude, ft.	Reduction, %
3,000	5
6,000	9
9,000	13
12,000	17

In the case of carburetters for engine running on alcohol fuel considerably larger jets are needed. In most cases a No. 113 needle jet will be required and the main jet size will require to be increased by an amount varying from 50% to 150% according to the grade of fuel used.

If the engine is run on fuel containing a small proportion of alcohol added to the petrol, a rough and ready guide is that the main jet should be increased by 1% for every 1% of alcohol in the fuel. In most cases alcohol blends available from petrol pumps do not contain sufficient alcohol to require any alteration to the carburetter setting.

The range of adjustment of the taper needle and the pilot air screw are determined by the size of the needle jet and of the pilot outlet respectively. Standard needle jets have a bore at the smallest point of ·1065 in. and are marked 106. Alternative needle jets ·1055 in., ·1075 in., ·109 in. and ·113 in. bore are available and are marked 105, 107, 109 and 113 respectively.

The standard pilot outlet bore is ·025 in. but in some cases larger size pilot outlets are used. Since the pilot outlet is actually drilled in the body of the carburetter it is necessary to have a carburetter with the correct size pilot outlet if the best results are to be obtained.

The accompanying table shows the standard settings for Amal Monobloc Carburetters used on Royal Enfield motor cycles.

3. Dismantling Carburetter

The construction of the carburetter is clearly shown in Fig. 3.

If the float chamber floods, first make sure that there is no dirt on the fuel needle seating. Owing

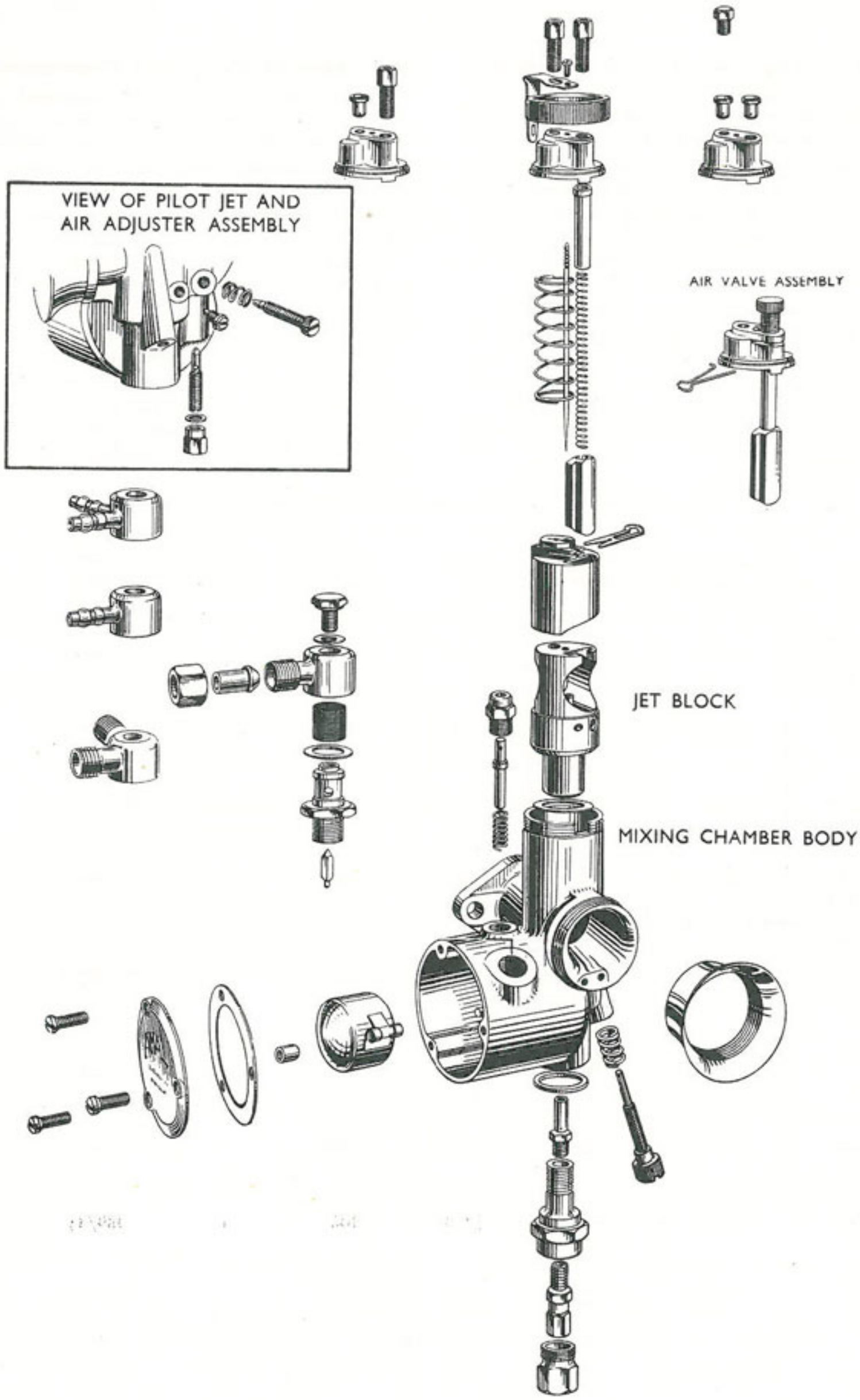


Fig. 3

to the use of a nylon needle and the leverage ratio between float and needle, flooding is very unlikely with this type of carburetter unless dirt is present or, of course, the float is punctured.

If it is necessary to remove the jet block note that this is withdrawn from the upper end of the mixing chamber after unscrewing the jet holder. Be careful not to damage the jet block when removing or refitting it. Note that the large diameter of the jet block pulls down on to a thin washer.

A single strand of an inner control cable is useful for clearing the small passages in the jet block and care must be taken not to enlarge these by forcing the wire through them. Compressed air from a pipe line or a tyre pump is preferable. A choked main jet should be cleared only by blowing through it.

4. Causes of High Petrol Consumption

If the petrol consumption is excessive first look for leaks either from the carburetter, petrol pipe, petrol tap(s) or tank. If coloured petrol is in use this will readily indicate the presence of any small leaks which otherwise might pass unnoticed. If the petrol system is free from leaks, carefully set the pilot adjusting screw as described in Subsection 2 to give the correct mixture when idling. Running with the pilot adjusting screw too far in is a common cause of excessive petrol consumption. If the consumption is still heavy try the effect of lowering the taper needle in the throttle slide by one notch. Do not fit a smaller main jet as this will not affect consumption except when driving on nearly full throttle and may make the mixture too weak at large throttle openings, thus causing overheating.

Settings for AMAL carburetters on ROYAL ENFIELD motor cycles

Machine	Carburetter Type No.	Choke Bore in.	Main Jet c.c.	Needle Jet	Needle Position	Throttle Valve	Pilot Jet c.c.
"250 Clipper" 1955 (late), 1956 1957 and 1958 (early)	375/10	25/32	120	105	3	375/060/4	25
"350 Bullet" 1955 (late), 1956–7–8	376/29	1	180	106	3	376/060/4	30
"500 Bullet" 1956–7–8	389/9	1 1/8	200	106	2	389/060/3½	30
"Super Meteor" 1956–7–8–9	376/41	1 1/16	240	106	3	376/060/3½	30
"Crusader 250" 1957–8–9 and **"250 Clipper"** 1958 (late) and 1959	375/16	7/8	120	105	3	375/060/3½	25
"Meteor Minor" 1958–9	376/92	25/32	250	106	2	376/060/3½	30
"350 Bullet" 1959	376/215	1 1/16	170	106	3	376/060/4	30
"500 Bullet" 1959	389/34	1 3/16	†250	106	3	389/3½	30
"Crusader Sports" 1959	376/216	15/16	150	106	3	376/060/3½	25
"Constellation" 1958–9	10TT9/A3768	1 3/16	480	109	3	175/311/5	*

* Adjustable

† With Air Cleaner. Main Jet 220 without Air Cleaner

SECTION G1d

Lucas Rotating Magnet Magneto Model SR2

Used on 1956 Super Meteor

1. General

The magneto rotor comprises a permanent magnet fitted with two laminated pole shoes. The stator consists of laminated pole pieces bridged by a laminated coil core. The coil has concentrically wound primary and secondary windings.

The rotor is driven by the engine through an automatic advance coupling and induces an alternating magnetic field in the laminated iron core of the coil. This field in turn induces alternating voltages in the primary and secondary windings of the coil. Magnetic flux due to current flowing in the primary winding tends to oppose any change in direction of the magnetic field in the laminated iron core. In this way, field reversals due to the rotating magnet are delayed until the contact breaker opens. This removes the restraining influence of the primary winding and the consequent rapid reversal of the magnetic flux linked with the coil causes a high voltage to be induced in the secondary winding.

The body of the magneto is formed of a single casting enclosed at the contact breaker end by a moulded cover. The cover is designed with the high tension cable outlets in a downward direction, thus preventing the retention of moisture at the terminal connections. The coil and capacitor are robustly constructed and specially treated to withstand very arduous conditions.

The automatic timing control is a centrifugally operated mechanism enabling an angular movement of the magneto rotor to occur relative to the drive. The mechanism consists of two members flexibly coupled by pivoted spring-loaded governor weights and toggles. At low engine speeds and during starting, the weights are closed and a delayed spark is produced. As the engine speed increases, the governor weights swing out and advance the rotor (and thus the cam and the spark) relative to the drive.

2. Routine Maintenance

(a) Lubrication

TAKE GREAT CARE TO PREVENT OIL OR GREASE GETTING ON OR NEAR THE CONTACTS.

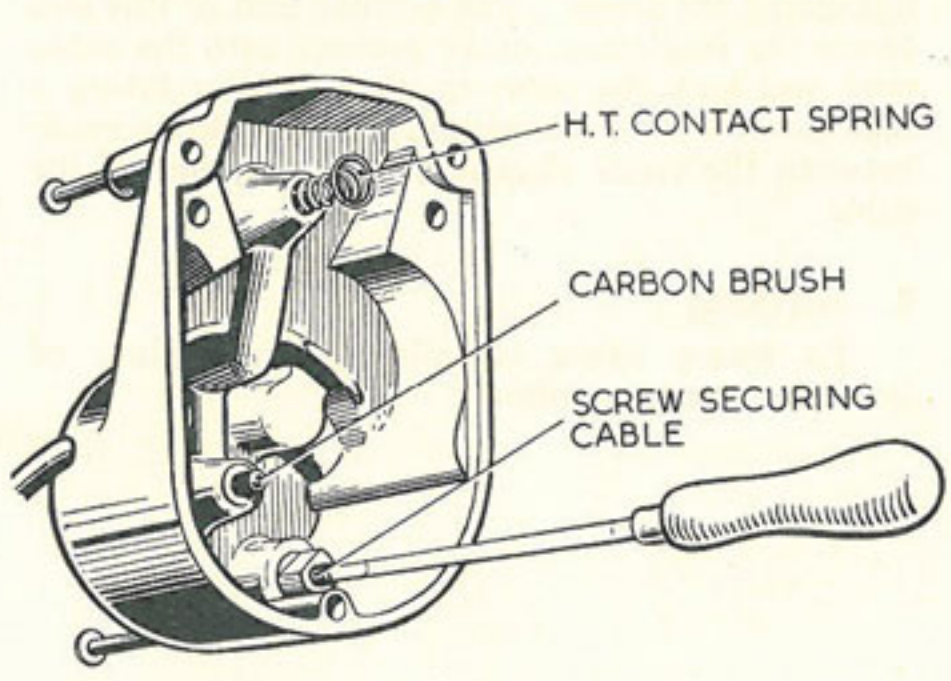
(i) After every 150 running hours (say 5,000 miles) remove the moulded cover and add a few drops of thin machine oil to the visible end of the contact breaker pivot post.

(ii) After 1,000 running hours (say 30,000 miles) remove the moulded cover and withdraw the rotating electrode. Slacken the fixed-contact plate securing screws and pivot the assembly to the fullest extent of the adjusting slots. Slacken the nut securing the end of the contact breaker spring. and lift off the moving-contact assembly. Smear the pivot pin with a small quantity of Mobilgrease No. 2 or its equivalent. Replace the components in the reverse order of dismantling.

(iii) The magneto rotor is mounted on ball bearings. These bearings are packed with high melting point grease before leaving the factory and require no attention for a considerable time. About every two years, or when the engine is undergoing a general overhaul, the magneto should be dismantled by a Lucas Service Depot or Agent and the bearings repacked with high melting point grease.

(b) Cleaning

(i) Occasionally remove the moulded cover and wipe the inside of the cover with a soft dry cloth.



TIGHTENING CABLE SECURING SCREW

Fig. 1

Clean the electrodes, the spaces between the electrodes and see that the carbon brush is clean and moves freely in its holder. Clean the outside of the cover before replacing it.

(ii) Examine the contact breaker. If the contacts are burnt or dirty, clean them by polishing with a very fine carborundum stone or fine emery cloth. The contacts may be cleaned more easily if the moving contact assembly is removed, as Sub-section 2 (a) (ii).

(c) Adjusting Contact Breaker

After cleaning check the gap between the contacts. Turn the engine until the contacts show the maximum opening which should measure 0·010 in. to 0·012 in. If the setting is incorrect slacken the two screws securing the fixed-contact plate and move the plate until the correct gap is obtained. Tighten the securing screws and measure the gap again. Check the gap for the other position of the engine giving maximum opening of the contacts. Refit the distributor gear so that the marked teeth of the gear and of the drive engage, retighten the gear retaining screw.

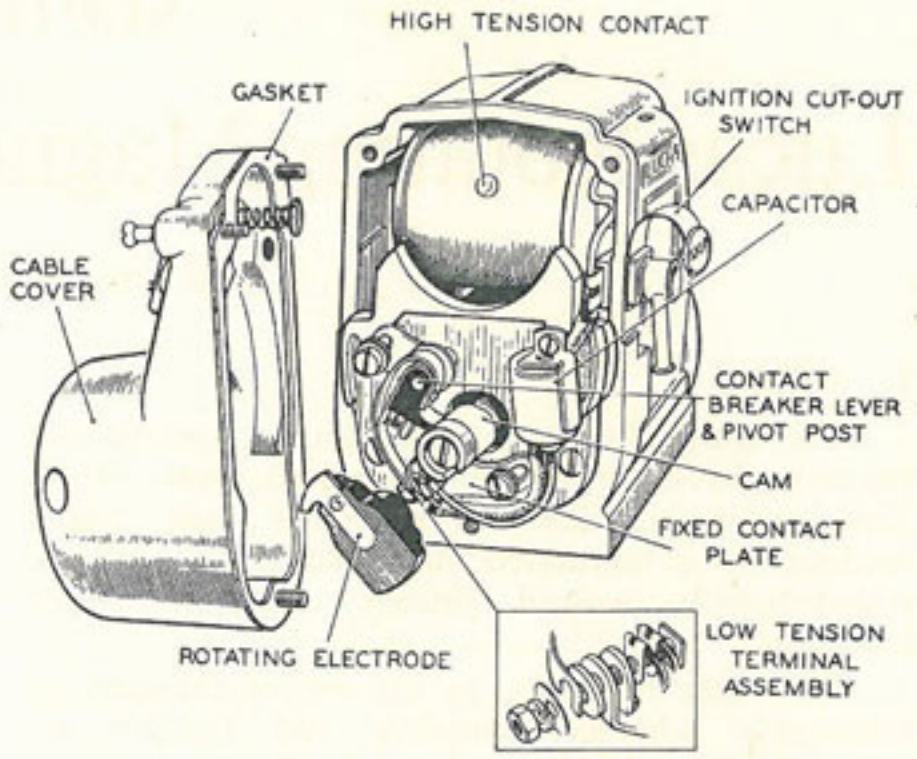
During the first 20 hours' running of a new magneto or replacement contact set, most of the bedding-down of the contact breaker heel occurs. The contact breaker gap should, therefore, be checked and, if necessary, reset as described above.

(d) Replacement of High Tension Cables

Use 7 mm. P.V.C. or neoprene-covered rubber insulated ignition cable for the high tension leads. When connecting a new cable to the magneto do not bare the cable but cut it off flush to the required length. Remove the moulded cover, slacken the cable retaining screw and pull out the old cable. Push the new cable fully home and secure by tightening the screw. The pointed end of this will pierce the insulation, make contact with the cable core and lock the cable in place. After fitting a high tension cable a continuity test should be made between the cover electrode and plug end of the cable.

3. Servicing

To locate cause of misfiring or failure of ignition, check as follows:—



MAGNETO MODEL SR2 WITH COVER REMOVED

Fig. 2

(i) Remove the sparking plugs from the engine. Hold the end of each high tension cable about $\frac{1}{8}$ in. from the cylinder block and operate the kick-starter. If strong and regular sparking is produced the sparking plugs should be cleaned and adjusted.

(ii) If no sparking is produced, examine the high tension cable and if necessary renew it as described in Sub-section 2(d).

(iii) Disconnect the cable to the cut-out switch at the magneto and re-test. If the magneto now functions normally the defect is in either the cable or the cut-out switch. Correct by replacement.

NOTE.—In no circumstances must the contact breaker cam be removed from or turned on the spindle. The cam is correctly positioned when the magneto is built and the performance of the instrument depends on this position being maintained.

4. Automatic Advance Mechanism

This is automatically lubricated and requires no attention beyond making sure that it operates freely and the springs are securely fastened. For timing instructions see Section C4, Subsection 4.

HOW TO LOCATE AND REMEDY TROUBLE

Condition	*Possible Causes*	*Method of Detection and Remedy*
ENGINE WILL NOT START.	Controls not set correctly for starting.	See that the ignition is switched on, petrol turned on and everything is in order for starting.
	Contact breaker inoperative.	Crank the engine and check that the contact breaker opens and closes correctly.
	Contacts need cleaning and adjusting.	Clean and adjust the contact breaker as described above.
	Plugs not sparking.	Detach the high tension cables from the plugs. Hold the cables $\frac{1}{8}$″ (3·17 mm.) from the engine and see if a spark jumps the gap when the engine is cranked. (i) If a spark is produced, check the plugs by substitution. (ii) If no spark is produced, check the cables by substitution. Clean and check inside of cable cover.
	Defect in cut-out circuit.	Disconnect the remote cut-out switch and crank the engine. If the engine now starts, renew the connecting cable or switch.
	Incorrect timing.	Check the magneto-to-engine timing. (See Section C4).
ENGINE MISFIRES.	Defective fuel supply.	Inspect the carburettor, petrol supply, etc.
	Sparking plugs need cleaning and adjusting.	Remove plugs from engine. Clean off soot or carbon and check plug ''points'' for correct gap width (·018 in.).
	Contacts need cleaning and adjusting.	Clean and adjust the contact breaker.
	Defective high tension supply.	Check high tension cables by substitution. Clean and check inside of cable cover.

If, after making the above checks, a fault in the magneto is suspected but cannot be located, the nearest Lucas Service Depot or Agent should be consulted.
When communicating with a Service Depot, it is necessary, in addition to describing the trouble, and the type and year of engine, to state the Model, Type and Service Number of the magneto.

SECTION G2e

Lucas A.C. Generator/Rectifier Charging Set

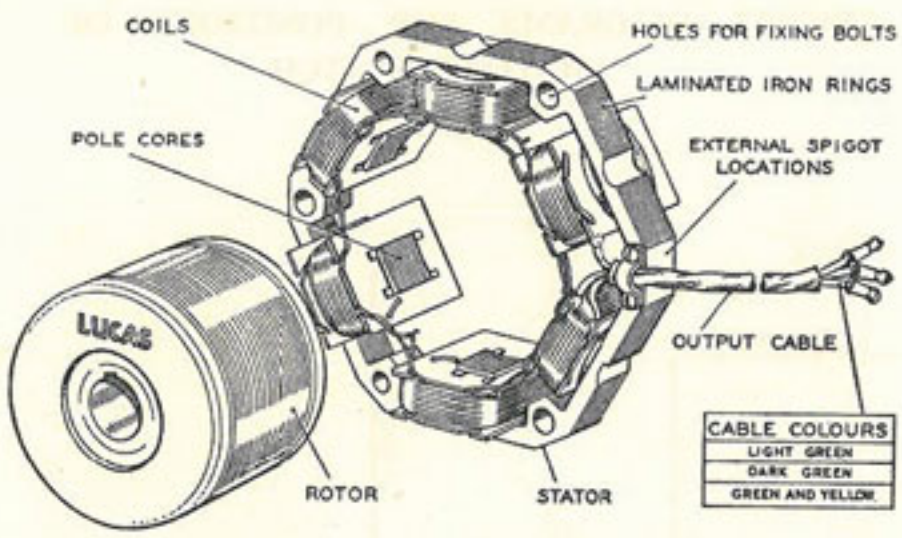
Used on 1956 ''Super Meteor''; 1956 ''350 and 500 Bullet''

1. General

The Lucas A.C. Generator/Rectifier set comprises four main components.

(1) Alternator with magnet rotor.
(2) Bridge-connected rectifier.
(3) Lighting switch.
(4) 6-volt battery. (See Section G4a).

Under normal running conditions, electrical energy in the form of rectified A.C. passes through the battery from the alternator, the rate of charge depending on the position of the lighting switch. When no lights are in use, the alternator output is sufficient only to trickle charge the battery. When the lighting switch is turned to the ''Pilot'' or ''Head'' positions the current increases proportionately.



STATOR AND ROTOR OF ALTERNATOR RM14
Fig. 1

2. Alternator Model RM14

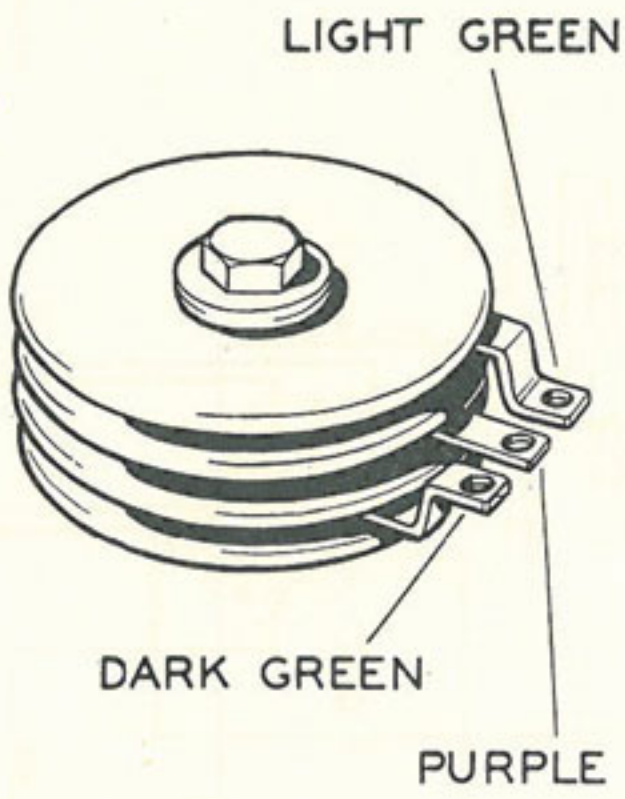
Model RM14 alternator (see Fig. 1) has an outside diameter of $5\frac{7}{8}$ in. and gives a high output at low r.p.m. The alternator comprises two main components, a stator and a rotor. The stator is built up from iron laminations and carries three pairs of series-connected coils insulated from the laminations. The rotor has a hexagonal steel core, each face of which carries a permanent magnet keyed to a laminated pole tip. The pole tips are riveted circumferentially to brass side plates, the assembly being cast in aluminium and machined to give a smooth external finish. The stator and rotor can be separated without the need to fit magnetic keepers to the rotor poles.

As the rotor turns, rapid and repeated reversals of flux take place in the coil cores. These lines cut through the turns of the coil and induce alternating voltages in that coil. External connections are taken to these coils from a bridge-connected rectifier (see Fig. 2).

3. Circuit Detail

The alternator stator carries three pairs of series connected coils, one pair being permanently connected across the rectifier bridge network. The purpose of this latter pair is to provide some degree of charging current for the battery whenever the engine is running.

Connections to the remaining coils vary according to the position of the lighting switch, as shown schematically in Fig. 3. The basic



GENERAL VIEW OF RECTIFIER
Fig. 2

charging circuits are as shown in Fig. 3 (a) (b) and (c) for lighting switch positions "Off," "Pilot" and "Head" respectively.

When no lights are in use the alternator output is regulated to its minimum value by interaction of the rotor flux and the flux set up by current flowing in the short-circuited coils.

In the "Pilot" position these coils are disconnected and the regulating fluxes are consequently reduced. The alternator output therefore increases and compensates for the additional parking light load.

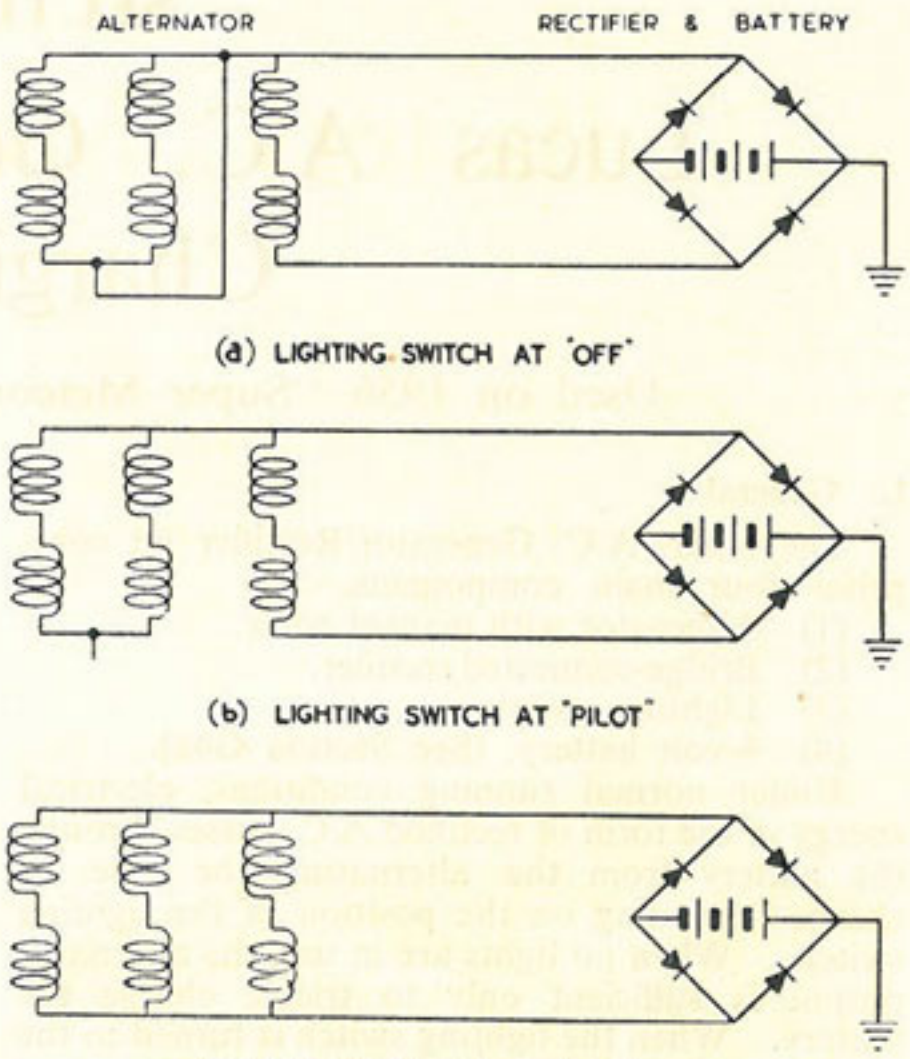
In the "Head" position the alternator output is further increased by connecting all three pairs of coils in parallel.

4. Maintenance

If the rotor or stator or the engine crankshaft or rear half of the chaincase have been disturbed the air gap between the rotor and stator should be checked. If a feeler gauge at least ·008 in. thick cannot be passed between the rotor and each of the stator poles the alignment should be checked.

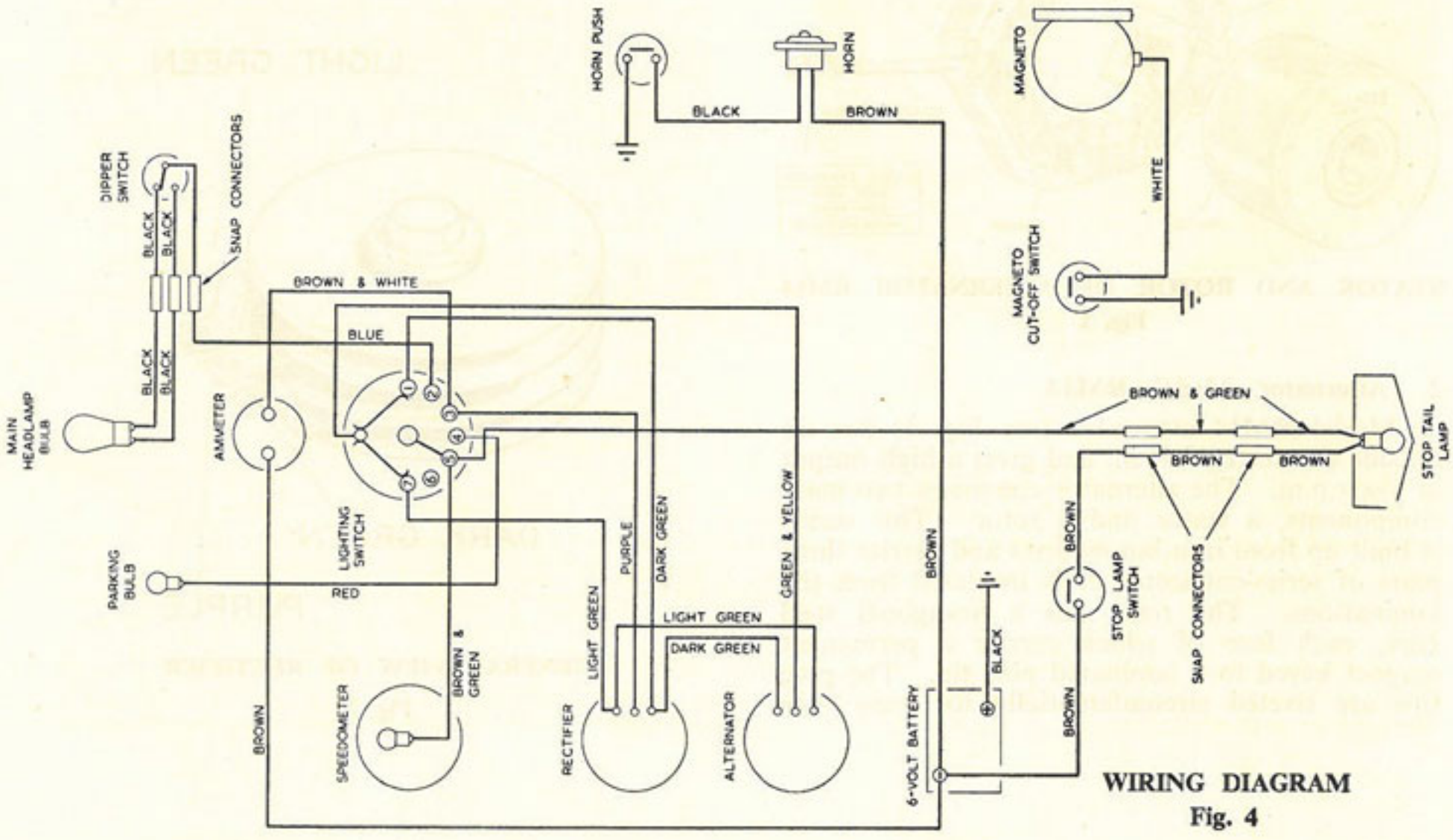
The nuts which clamp together the rectifier plate assembly must not under any circumstances be slackened. They have been carefully set during manufacture to give correct rectifier performance. A separate nut is used to secure the rectifier to the frame of the motor cycle.

Make sure that all cable connections including the snap connectors are clean and tight and that insulation on the cables is not worn or burnt through.



CIRCUIT DIAGRAMS FOR POSITIONS OF LIGHTING SWITCH

Fig. 3



WIRING DIAGRAM

Fig. 4

SECTION G4a

Battery Model PUZ7E

1. General

The model PUZ7E (see Fig. 1) is a ''dry-charged'' battery and is supplied without electrolyte but with its plates in a charged condition. When the battery is required for service it is only necessary to fill each cell with sulphuric acid of the correct specific gravity. No initial charging is required, but the battery must be left to stand at least one hour after filling before putting the machine into service.

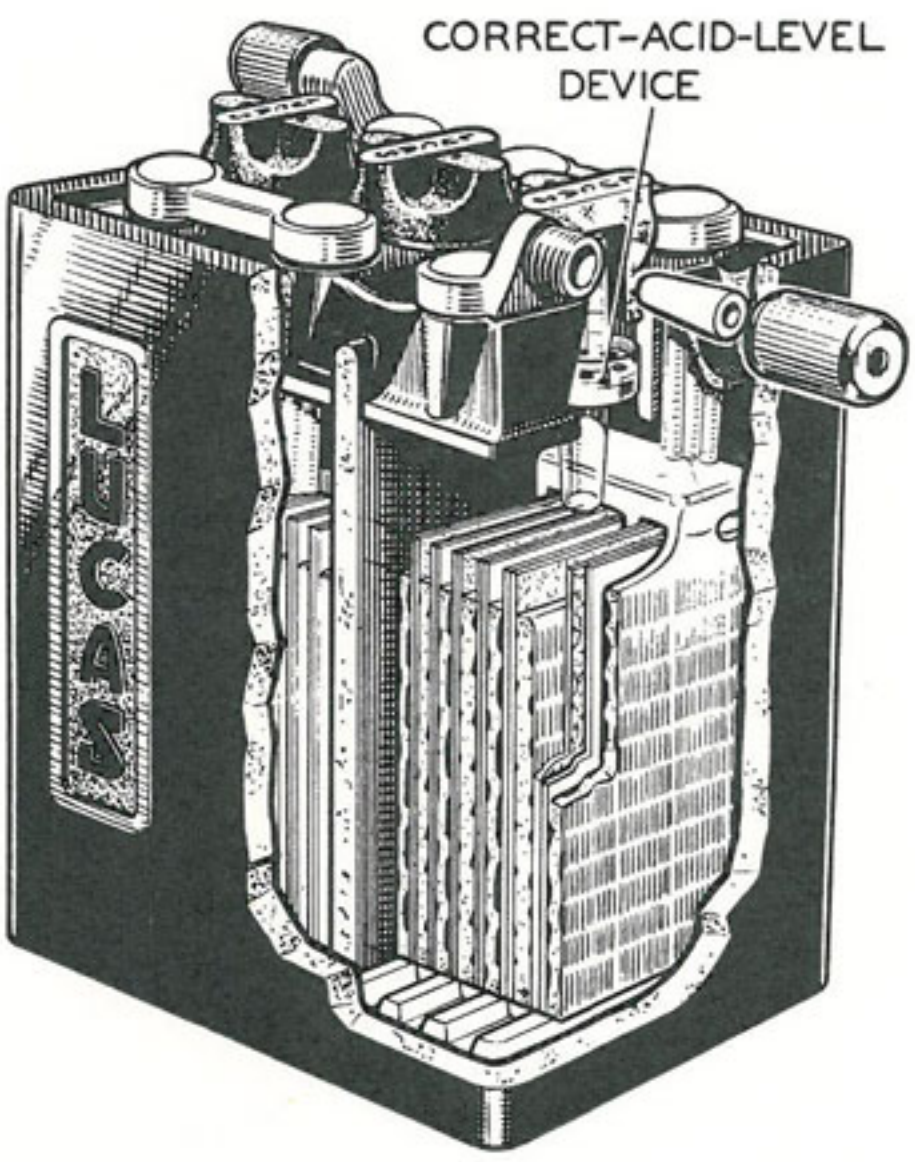


Fig. 1

2. Preparation for Service

The electrolyte is prepared by mixing together distilled water and concentrated sulphuric acid, using lead-lined tanks or suitable glass or earthenware vessels. Slowly add the acid to the water, stirring with a glass rod. Never add water to the acid, as this causes dangerous spurting of the concentrated acid. The specific gravity of the filling electrolyte depends on the climate in which the battery is to be used.

Specific gravity of electrolyte for filling ''dry-charged'' batteries :

Climates below 90°F. (32°C.)	Climates above 90°F. (32°C.)
Filling, 1·270	Filling, 1·210

The approximate proportions of acid and water to obtain these specific gravities :

To obtain specific gravity (corrected to 60°F.) of :	Add 1 vol. of 1·835 S.G. acid (corrected to 60°F.) to :
1·270	2·9 vols. of water.
1·210	4·0 vols. of water.

Heat is produced by the mixture of acid and water, the electrolyte should be allowed to cool before pouring it into the battery.

The specific gravity of the electrolyte varies with the temperature. For convenience in comparing specific gravities, they are always corrected to 60° F., which is adopted as a reference temperature.

The method of correction is as follows :—

For every 5°F. below 60°F., deduct ·002 from the observed reading to obtain the true specific gravity at 60°F. For every 5°F. above 60°F. add ·002 to the observed reading to obtain the true specific gravity at 60°F.

The temperature must be that indicated by a thermometer having its bulb actually immersed in the electrolyte and not the ambient temperature.

Fill the cells to the tops of the separators, *in one operation*. The battery filled in this way is 90% charged. When time permits, a short freshening charge for no more than four hours at the normal recharge rate of 1·5 amp. should be made.

3. Routine Maintenance

Fortnightly (or more frequently in hot climates) examine the level of electrolyte in the cells and if necessary add distilled water to bring the level up to the tops of the separators. The use of a Lucas Battery Filler will be found helpful, as it ensures that the correct electrolyte level is automatically maintained and also prevents distilled water from being spilled on the top of the battery (see Fig. 2).

Occasionally examine the terminals, clean and coat them with petroleum jelly. Wipe away all

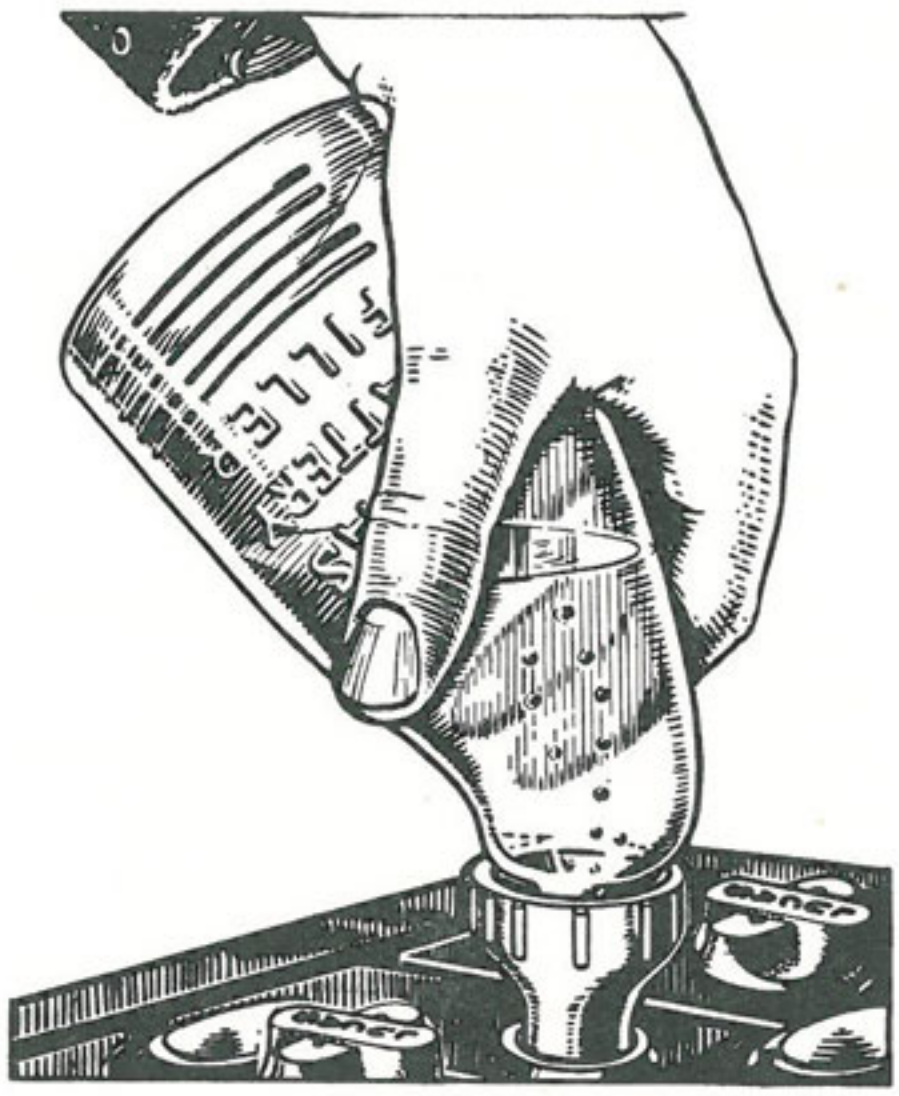


Fig. 2

dirt and moisture from the top of the battery and ensure that the connections are clean and tight.

4. Servicing

If the battery is subjected to long periods of night parking with the lights on, without suitable opportunities for recharging, a low state of charge is to be expected.

Measure the specific gravity of the acid of each cell in turn with a hydrometer (see Fig. 3).

The following table shows the state of charge at different values of specific gravities :

State of Charge	Temperature under 90°F.	Temperature over 90°F.
Battery fully charged ...	1·270—1·290	1·210—1·230
Battery about half charged ...	1·190—1·210	1·130—1·150
Battery fully discharged ...	1·110—1·130	1·050—1·070

If the battery is discharged, it must be recharged, either on the motor cycle by a period of daytime running or from an external D.C. supply at the normal recharge rate of 1·5 amp.

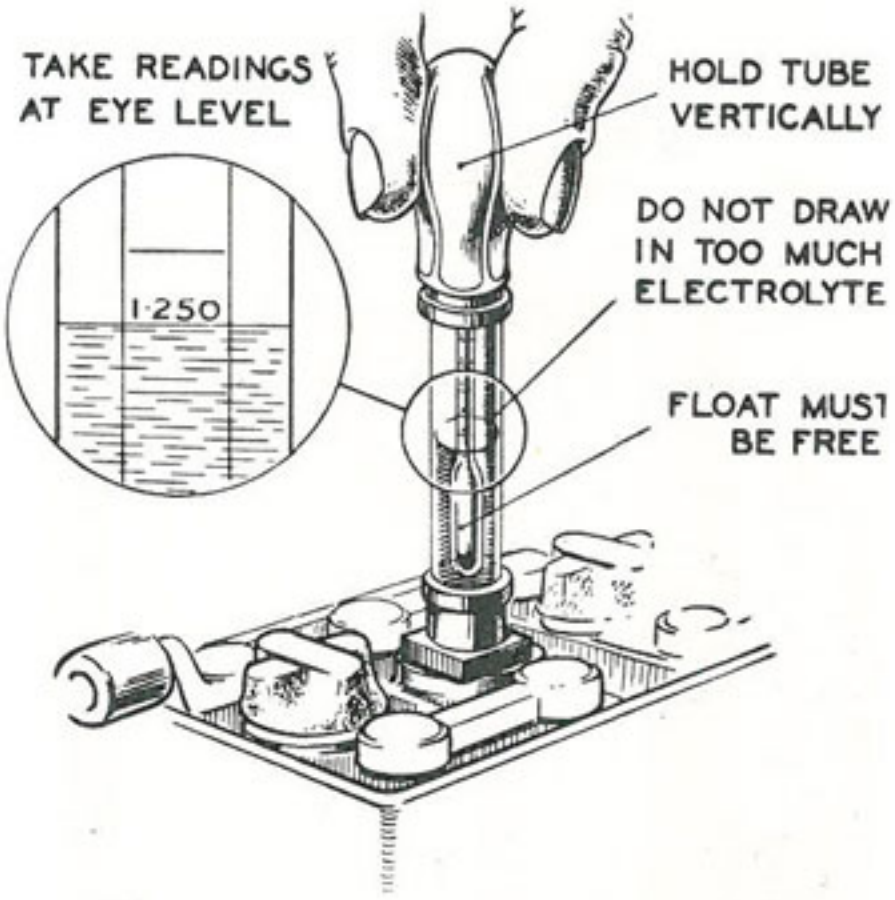


Fig. 3

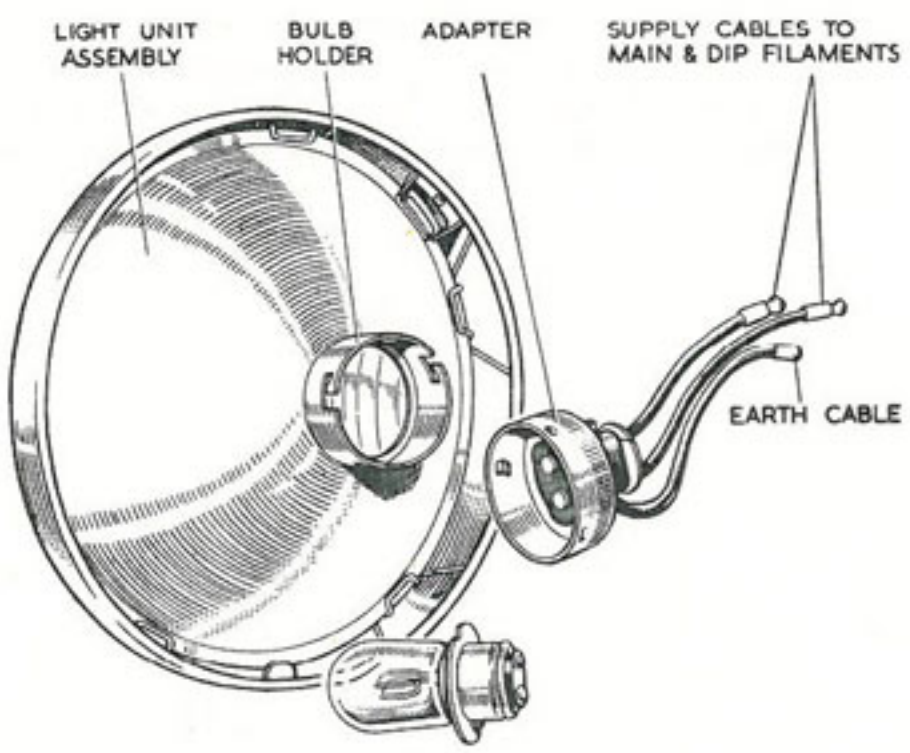
SECTION G5d

Head and Tail Lamps

Used on ''350 Bullet''; ''500 Bullet''; ''500 Twin''; ''Super Meteor'' 1956 onwards and ''Meteor Minor,'' 1958

1. Headlamp

In all the above Models the headlamp incorporates the Lucas Light Unit MCF700. This is built into the Casquette fork head which contains twin parking lamps as well as the ammeter and switch.



HEADLAMP MCF700
Fig. 1

2. Lucas Light Unit

The unit incorporates a combined reflector and front lens assembly (see Fig. 1). This construction ensures that the reflector and lenses are permanently protected, thus the unit keeps its high efficiency over a long period. A ''prefocus'' bulb is used, the filaments of which are accurately positioned with respect to the reflector, thus no focusing device is necessary.

The bulb has a large cap and a flange, which has been accurately positioned with relation to the bulb filaments during manufacture. A slot in the flange engages with a projection on the inside of the bulb holder positioned at the back of the reflector.

A bayonet-fitting adaptor with spring-loaded contacts secures the bulb firmly in position and carries the supply to the bulb contacts.

The outer surface of the lens is smooth to facilitate cleaning. The inner surface is formed of a series of lenses which determine the spread and pattern of the light beams.

In the event of damage to either the lens or reflector a replacement light unit must be fitted.

3. Replacing the Light Unit and Bulb

Slacken the securing screw at the top of the headlamp rim. Remove the front rim and Light Unit assembly.

Withdraw the adaptor from the Light Unit by twisting it in an anti-clockwise direction and pulling it off. Remove the bulb from its locating sleeve at the rear of the reflector.

Disengage the Light Unit securing springs from the rim and lift out the Light Unit.

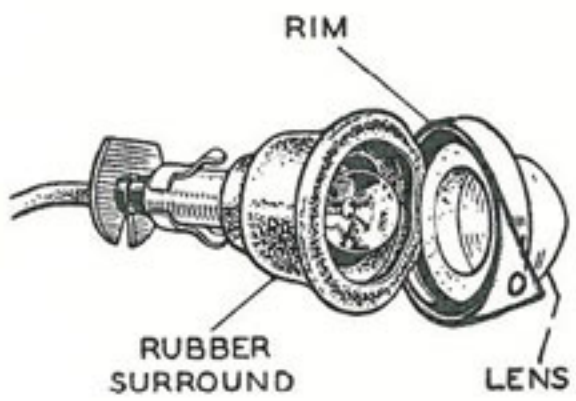
Position the new unit in the rim so that the word ''TOP'' on the lens is correctly located when the assembly is mounted on the headlamp. Refit the securing springs ensuring that they are equally spaced around the rim.

Replace the bulb and adaptor. The bulb must be the Lucas ''prefocus'' type—6 v. 30/24 watt Lucas No. 312.

Locate the bottom of the Light Unit and front rim assembly in the headlamp shell or in the fixing rim attached to the Casquette fork head. Press the front on and tighten the securing screw at the top of the headlamp.

4. Parking Lights

Access to the parking bulbs is obtained by removing the parking lamp rim (see Fig. 2). This is forced over the edge of the rubber lamp body and is additionally secured by means of a small fixing



PARKING LIGHT
Fig. 2

screw. After removal of the lamp rim the parking lamp lens can be pulled out of the rubber body, after which the bulb will be accessible.

5. Tail Light

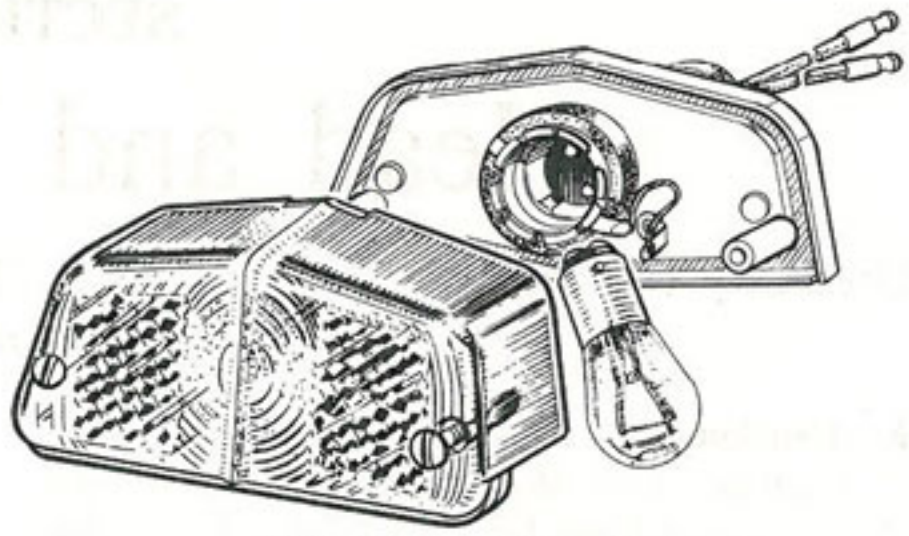
The Lucas lamp, Type 564 (Fig. 3) is a combined stop and tail light and also incorporates a reflector.

Access to the bulb is obtained by removing the two screws which secure the plastic cover.

The correct bulb is Lucas No. 384 6 volt 6/18 watt. The 6 watt filament provides the normal tail light, while the 18 watt filament is illuminated on movement of the brake pedal.

(**Note.**—6 watt bulbs are now required by law in Great Britain on machines of more than 250 c.c. capacity.)

Care must be taken that the leads to the stop tail lamp are correctly connected, as the use of the 18 watt filament on the normal tail light will not only discharge the battery but could cause trouble from excessive heat affecting the plastic cover. At the same time, the 6 watt filament, if used as a stop-tail light, will be ineffective in bright sunlight or at night when the tail light filament is illuminated.



STOP-TAIL LAMP L.564

Fig. 3

6. Centre Stand

To remove the centre stand unscrew the nut from one end of the stand spindle, knock out the latter and withdraw the stand complete with its bearing sleeve after disconnecting one end of the stand spring.

7. Wheel Alignment

Note that it is not possible to guarantee that the wheels are correctly aligned when the same notch position is used on both adjuster cams. It is therefore not sufficient to count the notches and use the same position on both sides of the machine. The only way to guarantee that the wheels are in line is to check the alignment from front wheel to back using either a straight edge or a piece of taut string. The alignment should be checked on both sides of the machine and if the front and rear tyres are of different section allowance must be made for this.

It is usual to check the alignment of the wheels at a point about six inches above the ground but, if the alignment is checked also towards the top of the wheels, it will be possible to ascertain whether or not the frame is twisted so as to cause one wheel to be leaning while the other is vertical. To do this it is always necessary to remove the mudguards and, unless a straight edge cut away in its centre portion is available, it will be necessary also to remove the cylinder, toolboxes, battery, etc., in order to allow an unbroken straight edge or a piece of taut string to contact the front and rear tyres.

8. Lubrication

The steering head races, swinging arm pivot bearing and stand pivot bearing should be well greased on assembly. The swinging arm pivot and stand pivot are provided with grease nipples but no nipples are provided for the steering head as experience has shown that the provision of nipples at this point causes trouble through chafing and cutting of control and lighting cables. If the steering head bearings are well packed they will last for several years or many thousands of miles.

Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C.3 or Shell Retinax A.

SECTION J1

Front Fork

With Casquette and Aluminium Alloy Bottom Tubes

Used on "Meteor 700," "500 Twin," "500 Bullet," "350 Bullet," 1954 onwards
"Super Meteor"

1. Description

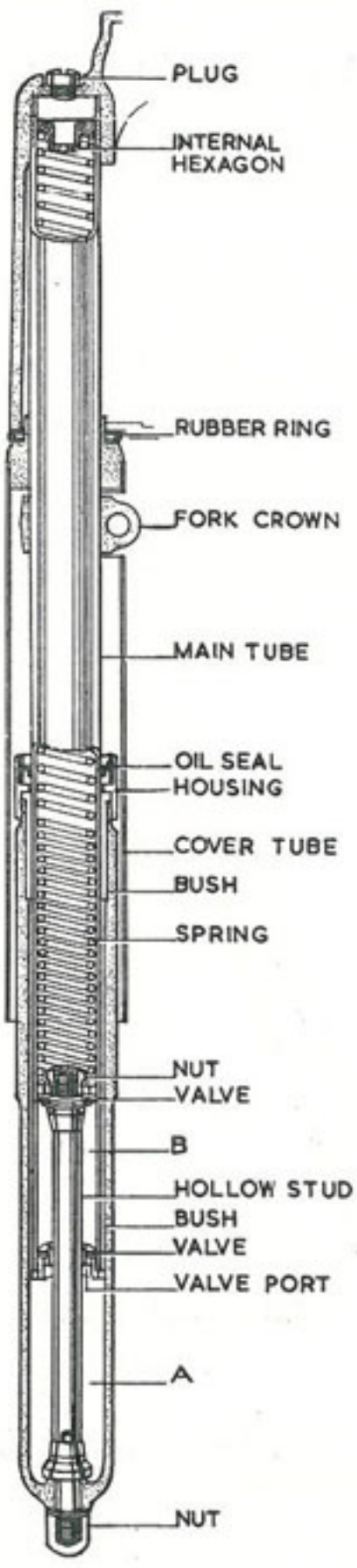
The telescopic fork consists of two legs each of which comprises a main tube of chrome molybdenum alloy steel tubing which is screwed into the Casquette fork head at the upper end and securely clamped to the fork crown. Fitted over the lower end of the main tube is the bottom tube made of high strength aluminium alloy with an integral lug which carries the wheel spindle. Fitted on the lower end of the main tube is a steel bush which is a close fit in the bore of the bottom tube. The upper end of the bottom tube carries a bronze bush which is a close fit over the outside diameter of the main tube. The bush is secured to the bottom tube by means of a threaded housing which contains an oil seal. A stud known as the "spring stud" is fitted in the lower end of the bottom tube and a valve port is secured to the lower end of the main tube. As the fork operates oil is forced between the spring stud and the bore of the valve port forming a hydraulic damping system. A compression spring is fitted inside the main tube between the upper end of the spring stud and the upper end of the main tube. The lower end of the main tube and upper end of the bottom tube are protected by a cover secured to the fork crown.

A special fork is available for sidecar machines. This has bottom tubes with extended wheel lugs giving less trail and is fitted with stronger springs and a steering damper.

2. Operation of the Fork

The fork provides a range of movement of 6 in. from the fully extended to the fully compressed position. The movement is controlled by the compression spring and by the hydraulic damping system. The hydraulic damping is light on the bump stroke and heavier on the rebound stroke, thus damping out any tendency to pitching or oscillation without interfering unduly with the free movement of the fork when the wheel encounters an obstacle.

The fork is filled with a light oil (S.A.E. 20) to a point above the lower end of the spring so that the damper chamber "B" is always kept



SECTION OF FORK LEG
Fig. 1

full of oil. Upward movement of the wheel spindle forces oil from the lower chamber "A" through the annular space between the spring stud (38067) and the bore of the main tube valve port (38138) into the damper chamber "B." During this stroke the pressure on the underside of the valve plate (38073) causes this to lift so that oil can also pass from "A" to "B" through the eight holes in the valve body. Since, however, the diameter of chamber "B" is less than that of chamber "A" there is not room in "B" to receive all the oil which must be displaced from "A" as the fork operates. The surplus oil passes through the cross hole in the spring stud and up the centre hole in the stud, spilling out through the nut (38076) which secures the upper end of the spring stud to the bronze guide at the lower end of the fork spring.

On the rebound stroke the oil in the damper chamber "B" is forced through the annular space between the spring stud and the bore of the main tube valve port. During this stroke pressure in chamber "B" closes the two disc valves at the upper and lower ends of the chamber so that the only path through which the oil can escape is the annular space between the spring stud and the port. Damping on the rebound stroke is therefore heavier than on the bump stroke. At the extreme end of either bump or rebound stroke a small taper portion on the spring stud enters the bore

MAIN TUBE SPANNER

Fig. 2

of the valve port, thus restricting the annular space and increasing the amount of damping. At the extreme end of the bump stroke the larger diameter taper on the oil control collar (38075) enters the main counterbore of the valve port thus forming a hydraulic cushion to prevent metal to metal contact.

3. Dismantling the Fork to Replace Spring, Oil Seal or Bearing Bushes

Place the machine on the centre stand, disconnect the front brake control and remove the front wheel and mudguard complete with stays. Unscrew the bottom spring stud nut (38080) which will allow oil to run out of the fork down to

MAIN TUBE SEAL GUIDE

Fig. 3

the level of the cross hole in the spring stud. Now knock the spring stud upwards into the fork with a soft mallet, thus allowing the remainder of the oil to escape. Pull the fork bottom tube down as far as possible, thus exposing the oil seal housing (38157). Unscrew this housing either by means of a spanner on the flats with which it is provided or by using the gland nut hand grips (E.5417). The bottom tube can now be withdrawn completely from the main tube, leaving the bottom tube bush, oil seal housing and oil seal in position on the main tube.

Now unscrew the main tube valve port using "C" spanner (E5418). The spring stud and spring can now be withdrawn from the lower end of the main tube.

The steel main tube bush (38156) can now be tapped off the lower end of the tube, if necessary using the bottom tube bush for this purpose. Before doing this, however, it is advisable to mark the position of the bush with a pencil line so as to ensure reassembling it in the same position on the main tube. The reason for this is that these bushes are finish ground to size after fitting on to the tubes so as to ensure concentricity. After

removal of the main tube bush the bottom tube bush, oil seal housing and oil seal can be removed.

In case of difficulty in removing the main tube bush it is possible to withdraw the oil seal housing after loosening the crown clip bolt 39038, removing the plug screw 38968 and unscrewing the main tube from the fork head by means of a hexagon bar ·500 in. across flats (Unbrako wrench W.11) or the special tool shown in Fig. 2.

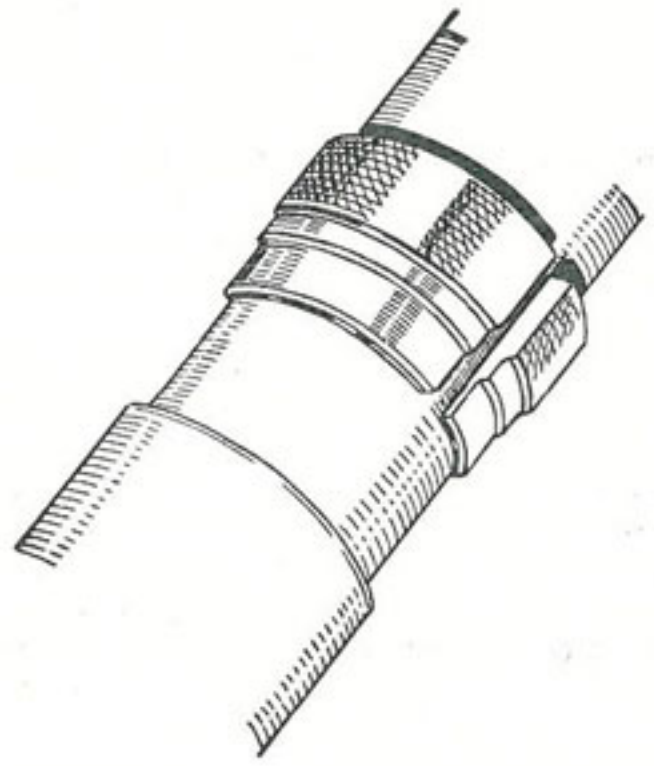
4. Spring

Solo and Sidecar springs are available. The free length of each is 20½ ins. The spring should be replaced if it has closed by more than 1 inch.

5. Reassembly of Parts

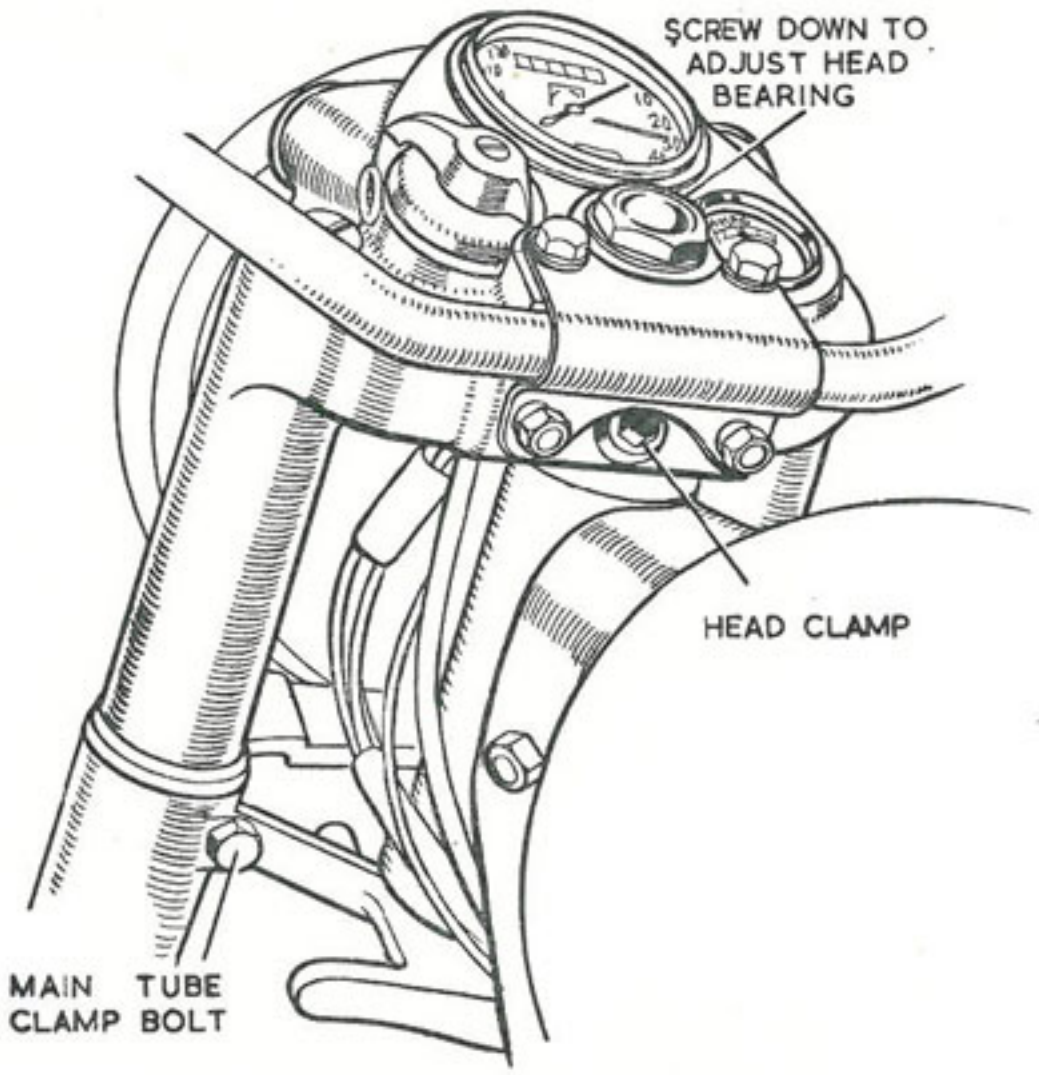
When refitting the oil seal, or fitting a new one, great care must be exercised not to damage the synthetic rubber lip which forms the actual seal. If the seal has been removed from the upper end of the main tube and is refitted from this end a special nose piece (Fig. 3) must be fitted over the end of the tube to prevent the thread from damaging the oil seal.

The spring stud is a tight fit in the hole at the lower end of the bottom tube. Once the stud has been entered in the hole push the bottom tube up sharply against the spring until two or three threads on the stud project beneath the end of the bottom tube. Now fit the nut and washer and pull the stud into position by tightening the nut. If necessary fit the nut first without the washer until sufficient thread is projecting to enable the washer to be fitted.



OUTER COVER CENTRALISING BUSHES

Fig. 5



SHOWING THE POSITIONS OF THE CLAMP BOLTS SECURING THE STEERING STEM AND FORK TUBES

Fig. 4

6. Steering Head Races.

The steering head bearing consists of two deep groove thrust races each containing nineteen ¼ in. diameter balls. The bearing is adjusted by tightening the steering stem locknut after loosening the ball head clip screw and both the fork crown clamp bolts. The head should be adjusted so that, when the front wheel is lifted clear of the ground, a light tap on the handlebars will cause the steering to swing to full lock in either direction, while at the same time there should be only the slightest trace of play in the bearings. When testing for freedom of movement the steering damper, if fitted, should be disconnected by unscrewing the anchor plate pin. Do not forget to tighten the ball head clip screw and fork crown clamp bolts. Before tightening the latter make sure that the cover tubes are located centrally round the main tubes so that the bottom tube does not rub inside the cover tube. A pair of split bushes (Fig. 5) is useful to ensure centralisation of the cover tubes.

7. Removal of Complete Fork

The fork complete with front wheel and mudguard can be removed from the machine if necessary by adopting the following procedure.

The leads to the lighting switch and ammeter should be disconnected from the battery, regulator, tail lamp, etc. at their lower ends or by means of the plug and socket connectors when these are provided. The switch and ammeter are push fits into the rubber bushes in the fork head.

Disconnect the speedometer drive from the speedometer head and unscrew the steering damper knob and rod (on sidecar forks) after removal of the split pin through the lower end of the rod. Undo the steering damper anchor plate pin so as to disconnect the damper from the frame of the machine.

Remove the two plug screws (38968) and loosen the steering head clip bolt and the two fork crown clamp bolts.

Now unscrew the fork main tubes from the fork head and the steering stem locknut from the top of the steering stem, turning each tube and the nut a turn or two at a time. When the nut has been removed from the steering stem and the main tubes have been completely unscrewed from the fork head the complete fork and wheel with steering stem can be lifted out of the head lug of the frame.

8. Lubrication

The lubrication of the fork bearings is effected by the oil which forms the hydraulic damping medium. All that is necessary is to keep sufficient oil in the fork to ensure that the top end of the bottom spring stud is never uncovered even in the full rebound position. The level of oil in the fork can be gauged by removing the top plug screw and inserting a long rod about ⅜ in. diameter. If slightly tilted this will ledge against the nut at the upper end of the bottom spring stud and indicate the level of oil above the stud. If the fork is empty to start with the quantity required is approximately 7½ fluid ounces in each leg. Recommended grades of oil are Castrolite, Mobiloil Arctic, Essolube 20, B.P. Energol S.A.E. 20 and Shell X-100 20/20W.

9. Air Vents

The earlier forks of this type were provided with holes at the upper end of each main tube communicating with small vent holes in the Casquette head. Experience has shown that on rough roads oil may escape through these air vents which in consequence are now omitted. Escape of oil from the earlier forks can be largely eliminated by fitting specially long plug screws which are available. The Part Number is 40118. If these are fitted and the final vent hole is stopped up with a wooden plug leakage at this point is impossible. Fitting the special plug screws alone is sufficient in most instances.

SECTION K3

Front Wheel

With Dual 6 in. Brake

Fitted to "Super Meteor,"
"500 Twin," "500 Bullet," "350 Bullet," 1956 onwards

1. Removal from Fork

To remove the front wheel from the fork place the machine on the centre stand and front stand, if fitted, or alternatively with sufficient packing (about 2 in.) beneath each side of the stand to lift the wheel clear of the ground when tilted back on to the rear wheel. Slacken brake cable adjustments and disconnect cables from handlebar lever and from operating cam levers on hub. Unscrew the four nuts securing the fork bottom tube lug caps (Part No. 38593) and allow the wheel to drop forwards out of the front fork. Make sure that the machine stands securely on the rear wheel and centre stand—if necessary place a weight on the saddle or a strut beneath the fork to ensure this.

2. Removal of Brake Cover Plate Assemblies

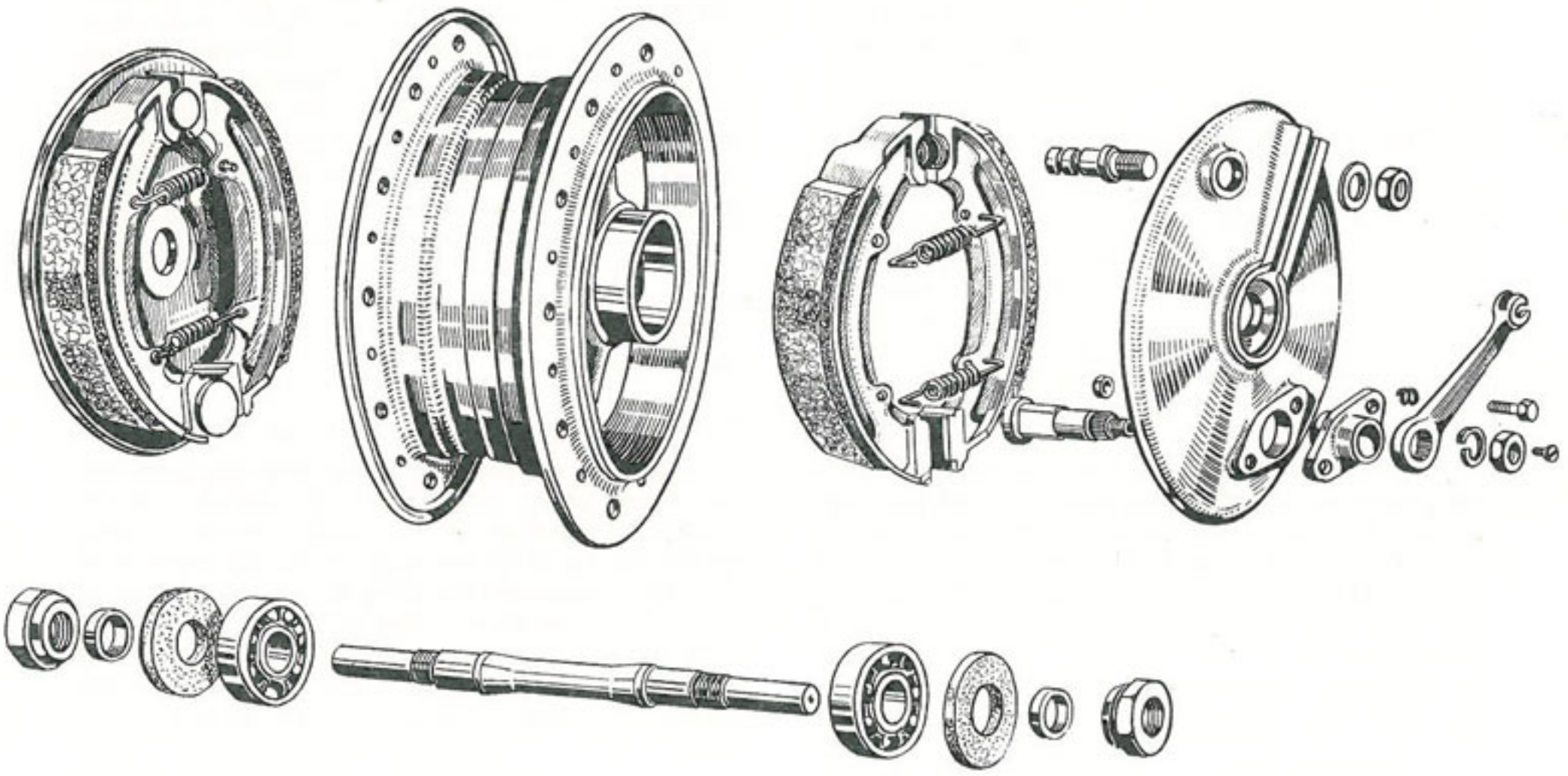
Lock the brake "on" by pressure on the operating lever, 38905 (R.H.) or 38906 (L.H.), and unscrew the cover plate nuts 31347. The right and left hand cover plate assemblies can then be withdrawn from the respective brake drums.

3. Removal of Brake Shoes and Springs

Unhook the springs from the shoes and lift away the latter. The pivot post and operating cam can then be withdrawn after removing the nuts which secure them.

4. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets (Part No. 42469BX)



DUAL FRONT BRAKE
Fig. 1

or ready fitted to service replacement brake shoes (Part No. 41342SR). When riveting linings to shoes, secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MS3, which are drilled to receive cheese-headed rivets.

Note : Some hubs were supplied fitted with bonded brake linings with no rivets. These can be serviced only by the use of the service replacement brake shoes (Part No. 41342SR).

5. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings having already removed the brake cover plate assemblies, lift out the felt washers, Part No. 21466, and distance washers, Part No. 30538. Now hit one end of the wheel spindle with a copper hammer or mallet, thus driving it out of the hub bringing one bearing with it and leaving the other in position in the hub. Drive the bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub the other way, when it will bring out the remaining bearing.

6. Hub Bearings

These are deep groove single row journal ball bearings $\frac{5}{8}$ in. i/d by $1\frac{9}{16}$ in. o/d by $\frac{7}{16}$ in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ$\frac{5}{8}$ in., Fischer LS7.

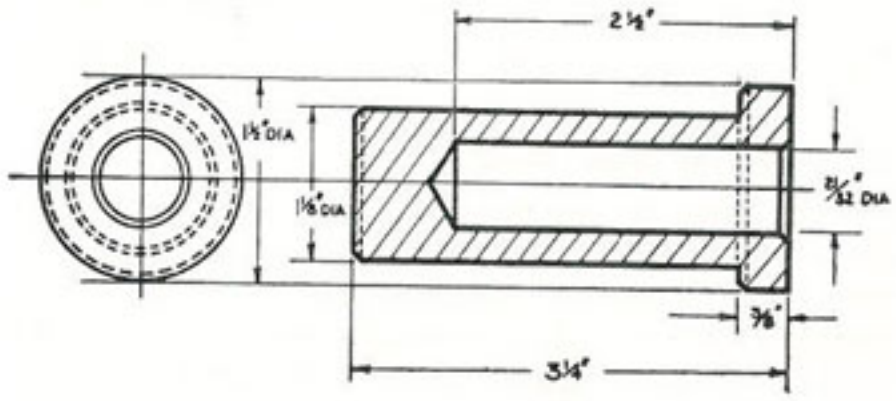
7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, 30538, which in turn are held up by the cover plate nuts 31347. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the hub barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel but this fit must not be so tight as to close down the outer race of the bearing and thus overload the balls. The following are the manufacturing tolerances which control the fit of the bearings. The figures for the bearings themselves are for SKF bearings but other manufacturers' tolerances are similar.

Bearing o/d	1·5622/1·5617 in.
Housing bore	1·5620/1·5616 in.
Bearing bore	·6252/·6247 in.
Shaft diameter	·6252/·6248 in.

8. Refitting Ball Bearings

To refit the bearings in the hub two hollow drifts are required, as shown in Fig. 2. One bearing is first fitted to one end of the spindle by means of the hollow drift; the spindle and bearing are then entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper



DRIFT FOR REFITTING BEARINGS
Fig. 2

end of the spindle and driven home by means of the second hollow drift either under a press or by means of a hammer which will thus drive both bearings into position simultaneously. In order to make quite sure that there is clearance between the inner faces of the outer bearing races and the bottom of the recesses, fit the distance washers, 30538, and the cover plate nuts, 31347, with either the cover plates themselves or additional packing washers behind the nuts. Tightening the nuts should not have any effect on the ease with which the spindle can be turned. If tightening the nuts makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

9. Reassembly of Brake Shoes to Cover Plates

Assemble the pivot pin and operating cam into the cover plate, putting a little grease on the cylindrical portion of the cam. Smear a little grease on the pivot pin and on the flat portion of the cam. Assemble the shoes in position and hook the springs into them. The easiest way to do this is to hold the brake assembly in a vice by means of the locknut on the pivot pin and then pull the springs by means of a loop of fine strong string.

10. Floating Cam Housings

Note that the cam housings, Part No. 26836, are intended to be left free to float. The bolt holes

in the cam housings are slotted and the securing pins, Part No. 252, are provided with double coil spring washers beneath their heads to enable them to be tightened sufficiently to prevent the cam housings moving under the influence of road shocks, while at the same time they can be, and should be, left free enough to be capable of being moved by hand in the direction of the slots. The pins, 252, are secured by locknuts, 7916, which are centre punched as an additional precaution.

The leading shoes (i.e. those towards the rear of the machine) have a servo action which render them more effective than the trailing shoes. This servo action causes the linings on the leading shoes to wear more quickly than those on the trailing shoes and at the same time tends to lift the leading shoes off the cams and press the trailing shoes harder on to the cams. With a fixed cam housing the result is that the majority of the cam pressure is applied to the less efficient trailing shoe. By leaving the housing free to float the cam can follow up the leading shoe thus maintaining equal pressure between the cam and the two shoes and so making full use of the more efficient leading shoe. Owing to the servo action the wear on the leading shoe with a floating cam housing is greater than that of the trailing shoe and in time the limit of float of the cam housing will be reached, after which the brake will continue to function as a fixed cam brake with some loss of efficiency. This can be restored by removing the shoes and fitting them in the opposite positions. Floating cam brakes are self-centering and there is no need to take any special precautions to see that the two linings are of equal thickness or that the brake shoe assembly is centered in the drum.

11. Refitting Brake Cover Plates

After assembling the brake shoe pivot pins and operating cams into the cover plates repack the hub bearings with grease. The recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way into the hubs.

Before fitting the distance washers and felt washers make sure that the inside of the brake drums are quite clean and free from oil or grease, damp, etc., and replace the brake cover plate assemblies. Securely tighten the cover plate nuts, 31347.

12. Wheel Rim

The rim is Type WM2—19 in. plunged and pierced with forty holes for spoke nipples. The spoke holes are symmetrical, i.e. the rim can be assembled to the hub either way round. Rim diameter after building is 19·062 in., tolerances on the circumference of the rim shoulders where the tyre fits being 59·930/59·870 in. The standard steel measuring tape for checking rims is $\frac{5}{16}$ in. wide, ·011 in. thick and its length is 59·964/59·904 in.

13. Spokes

The spokes are of the single butted type 8—10 gauge with 90° countersunk heads, angle of bend 95°—100°, length $6\frac{5}{8}$ in., thread diameter ·144 in., 40 threads per inch, thread form British Standard Cycle.

14. Wheel Building and Truing

The spokes are laced one over two and the wheel rim must be built central in relation to the nuts which secure the brake cover plates. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

15. Tyre

The standard tyre is Dunlop 3·25—19 in. Ribbed tread.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the toolkit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark, indicating a balance point, this should be fitted near the valve.

16. Tyre Pressure

The recommended pressure for the front tyre is 18 lb. per square inch for wheel loads up to 240 lb.

17. Lubrication

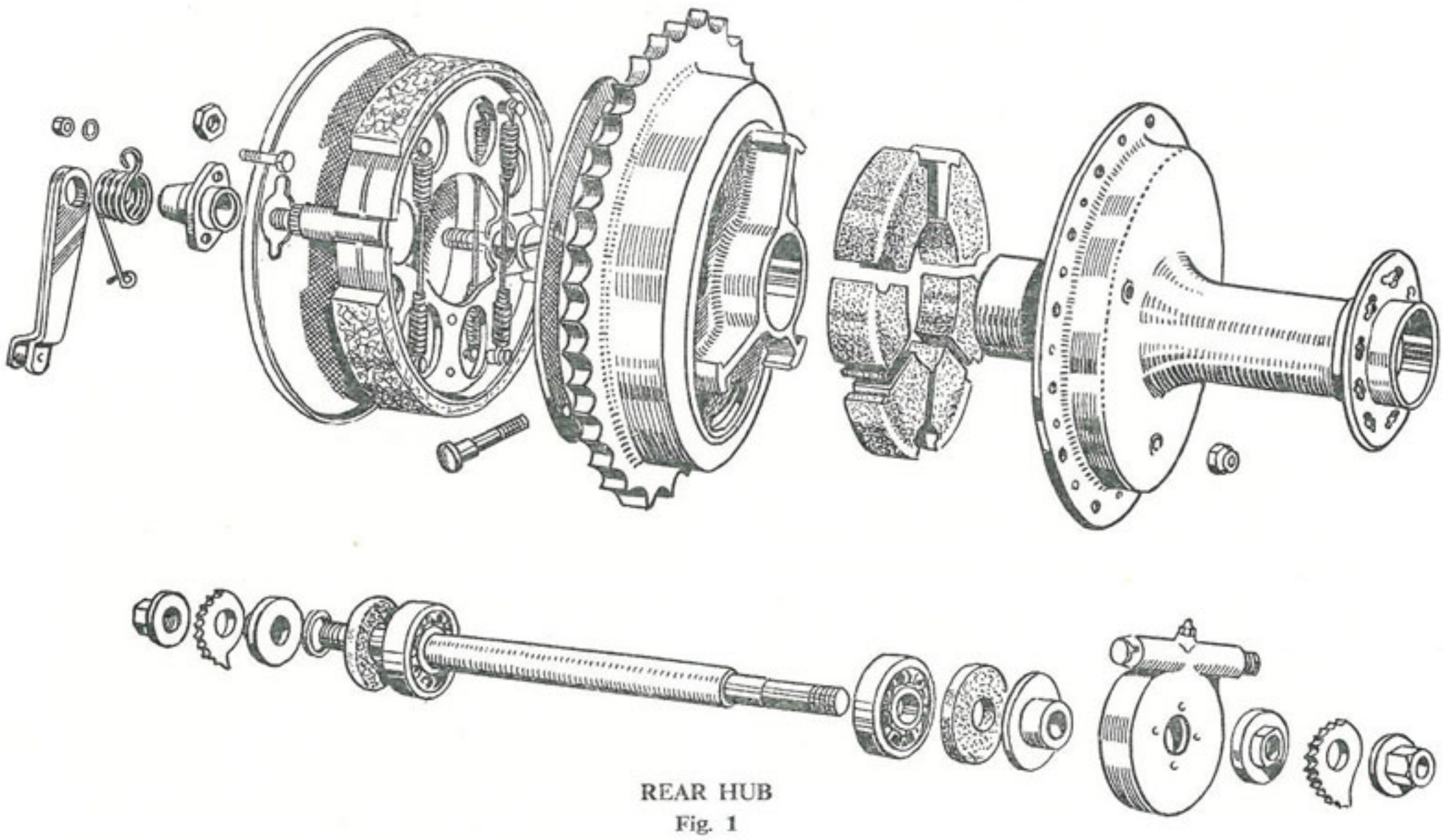
Two greasing points are provided both of which lead grease to the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to trouble through grease finding its way past the felt seals on to the brake linings) these greasing points are of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

Note that the brake cams are drilled for grease passages but the ends of these are stopped up with countersunk screws instead of being fitted with grease nipples. This is done to prevent excessive greasing by over-enthusiastic owners. If the cams are smeared with grease on assembly they should require no further attention but in case of necessity it is possible to remove the screws, fit grease nipples in their place and grease the cams by this means.

SECTION L2

Rear Wheel (Non-Detachable Type)

Part No. 36788 for "500 Twin" and "350 Bullet"; Part No. 37278 for "Super Meteor"; "Meteor 700" and "500 Bullet."



REAR HUB
Fig. 1

1. Description

These instructions cover the servicing of two different rear wheels, both of the non-detachable type incorporating a rubber cush drive and an internal expanding brake. Both types have a solid spindle and give a 3 in. chain line.

The heavier type used on the "Meteor 700" and "500 Bullet" has a 7 in. diameter brake drum while the lighter type used on the "500 Twin" and "350 Bullet" has a 6 in. diameter brake.

2. Removal and Replacement of Wheel

Place machine on the centre stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Remove the dual seat, if fitted, and the detachable portion of the rear mudguard. Disconnect the rear driving chain at the spring link and remove the chain from the rear wheel sprocket, leaving it in position on the gearbox countershaft sprocket. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake operating lever. Unscrew the brake cover plate anchor nut and remove this together with the washer behind it. Disconnect the speedometer driving cable, loosen the spindle nuts and mark the chain adjuster cams to ensure replacing in the same position. Slide the wheel out of the fork ends, tilting it so as to disengage the end of the brake shoe pivot pin from the slot in the fork end.

When replacing the wheel make sure that the dogs on the speedometer drive gearbox are engaged with the slots in the end of the hub barrel. Make sure also that the speedometer drive gearbox is correctly positioned so that there is no sudden bend in the driving cable. Make sure that the closed end of the spring link points in the direction of travel of the chain. Replace the chain adjuster cams in their original positions or, if necessary, turn each of them the same number of notches to tension the chain and maintain correct wheel alignment. Do not forget to refit the brake rod and adjust the brake so that the wheel turns freely while the brake is off, while at the same time only a small travel of the brake pedal is necessary to put the brake on.

3. Removal of Brake Shoes for Replacement, Fitting New Linings, etc.

Remove the complete wheel as described above, then remove the left hand spindle nut, chain adjuster and distance collar, thus permitting the complete brake cover plate with operating cam, pivot pin, shoes and return springs to be lifted off the hub spindle.

In the case of the 7 in. brake fitted to the "Meteor 700" and "500 Bullet" Models the brake shoes can then be removed, after detaching the return springs.

In the case of the 6 in. brake fitted to the "500 Twin" and "350 Bullet" Models, unscrew the pivot pin locknut and the operating lever nut, after which the assembly of the brake shoes, return springs, pivot pin and operating cam can be removed from the cover plate by unscrewing the pivot pin and applying light blows with a hammer and drift on the end of the operating cam. The return springs can then be unhooked from the spring posts in the brake shoes, thus allowing the whole assembly to fall apart.

4. Replacing Brake Linings

Brake linings are supplied either in pairs ready drilled complete with rivets, Part No. 37786BX (6 in. shoes) or 37787BX (7 in. shoes), or ready fitted to service replacement brake shoes, Part No. 38042 (6 in. shoes) or 38043 (7 in. shoes). When riveting linings to shoes secure the two centre rivets first so as to ensure that the lining lies flat against the shoe. Standard linings are Ferodo MR41 which are drilled to receive cheese headed rivets.

5. Removal of Hub Spindle and Bearings

To remove the hub spindle and bearings, having already removed the brake cover plate assembly and speedometer drive gearbox, lift out the felt washers and distance pieces then hit one end of the spindle with a copper hammer or mallet thus driving it out of the hub, bringing one bearing with it and leaving the other in position in the hub. Drive the bearing off the spindle and insert the latter once more in the hub at the end from which it was removed. Now drive the spindle through the hub in the opposite direction, when it will bring out the remaining bearing.

6. Hub Bearings

These are deep groove single row journal ball bearings. The lighter bearings used in the "350 Bullet" and "500 Twin" hubs are $\frac{5}{8}$ in. i/d by $1\frac{9}{16}$ in. o/d by $\frac{7}{16}$ in. wide. The Skefko Part No. is RLS5. Equivalent bearings of other makes are Hoffmann LS7, Ransome and Marles LJ $\frac{5}{8}$ in., Fischer LS7.

The heavier bearings used in the "Meteor 700" and "500 Bullet" Models are $\frac{5}{8}$ in. i/d by $1\frac{13}{16}$ in. o/d by $\frac{5}{8}$ in. wide. The Skefko Part No. is RMS5. Equivalent bearings of other makes are Hoffmann MS7, Ransome and Marles MJ $\frac{5}{8}$ in., Fischer MS7.

7. Fitting Limits for Bearings

The fit of the bearings in the hub barrel is important. The bearings are locked on the spindle between shoulders and the distance pieces, which in turn are held up by the cover plate nuts. In order to prevent endways pre-loading of the bearings it is essential that there is a small clearance between the inner edge of the outer race of the bearing and the back of the recess in either end of the hub barrel. To prevent any possibility of sideways movement of the hub barrel on the bearings it is, therefore, necessary for the bearings to be a tight fit in the barrel but this fit must not be so tight as to close down the outer race of the bearing and thus overload the balls. The following are the manufacturing tolerances which control the fit of the bearings. The figures for the bearings themselves are for SKF bearings but other manufacturers' tolerances are similar.

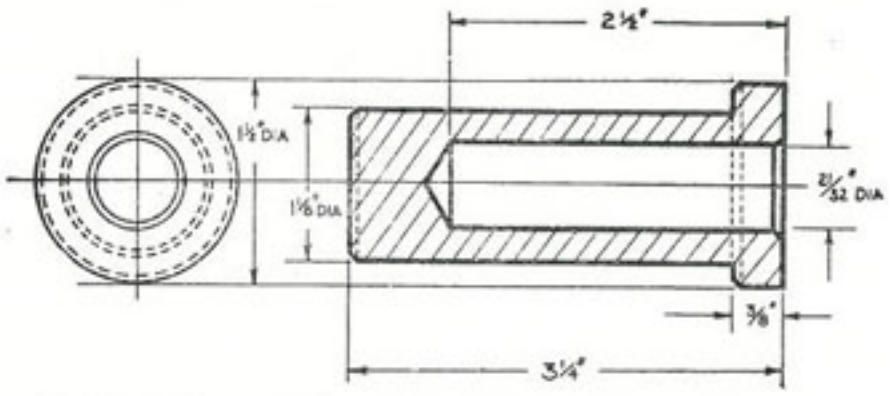
	"350 Bullet" and "500 Twin"	**"Meteor 700" and "500 Bullet"**
Bearing o/d	1·5622/1·5617 in.	1·8122/1·8117 in.
Housing bore	1·5620/1·5615 in.	1·8115/1·8110 in.
Bearing bore	·6252/·6247 in.	·6252/·6247 in.
Shaft diameter	·6252/·6248 in.	·6252/·6248 in.

8. Refitting Ball Bearings

Note that the two ends of the spindle are not identical. The end with the shorter plain portion between the thread and the shoulder must be fitted to the brake drum side of the wheel.

To refit the bearings in the hub two hollow drifts are required, as shown in Figs. 2 and 3. One bearing is first fitted to one end of the spindle by means of the hollow drift; the spindle and bearing

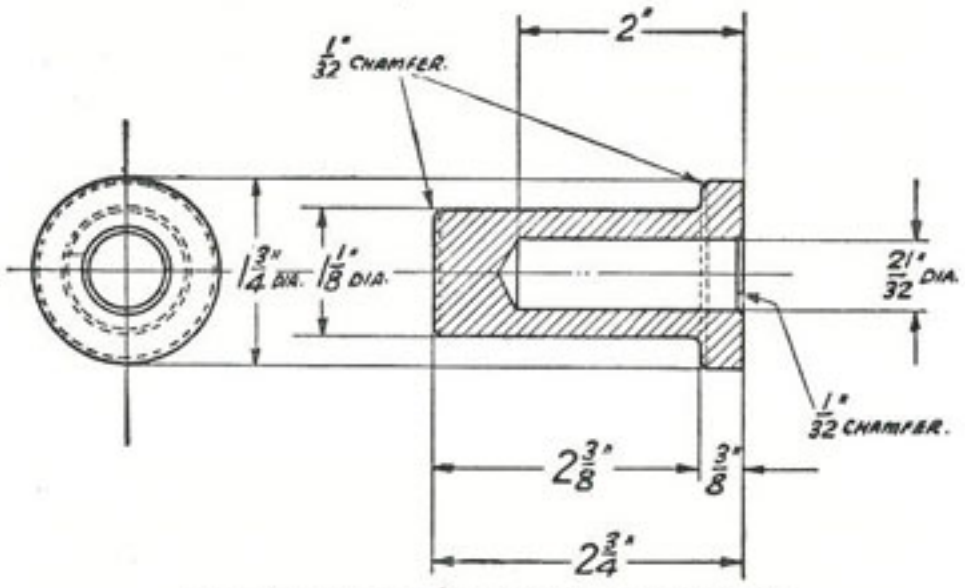
are then entered into one end of the hub barrel which is then supported on one of the hollow drifts. The other bearing is then threaded over the upper end of the spindle and driven home by means of the second hollow drift either under a press or by means of a hammer which will thus drive both bearings into position simultaneously.



DRIFT FOR REFITTING BEARINGS
"350 Bullet" "500 Twin"

Fig. 2

In order to make quite sure that there is clearance between the inner faces of the outer bearings and the bottom of the recesses fit the distance washers against the inner races of the bearings and either fit the assembly of brake cover plate, speedometer gearbox, etc., or make up this distance with tubular distance pieces. Fit and tighten the spindle nuts. Tightening the nuts



DRIFT FOR REFITTING BEARINGS
"Meteor 700" "500 Bullet"

Fig. 3

should not have any effect on the ease with which the spindle can be turned. If tightening the nuts makes the spindle hard to turn this may be taken as proof that the bearings are bottoming in the recesses in the hub barrel before they are solid against the shoulders on the spindle. In this case the bearing should be removed and a thin packing shim fitted between the inner race and the shoulder on the spindle.

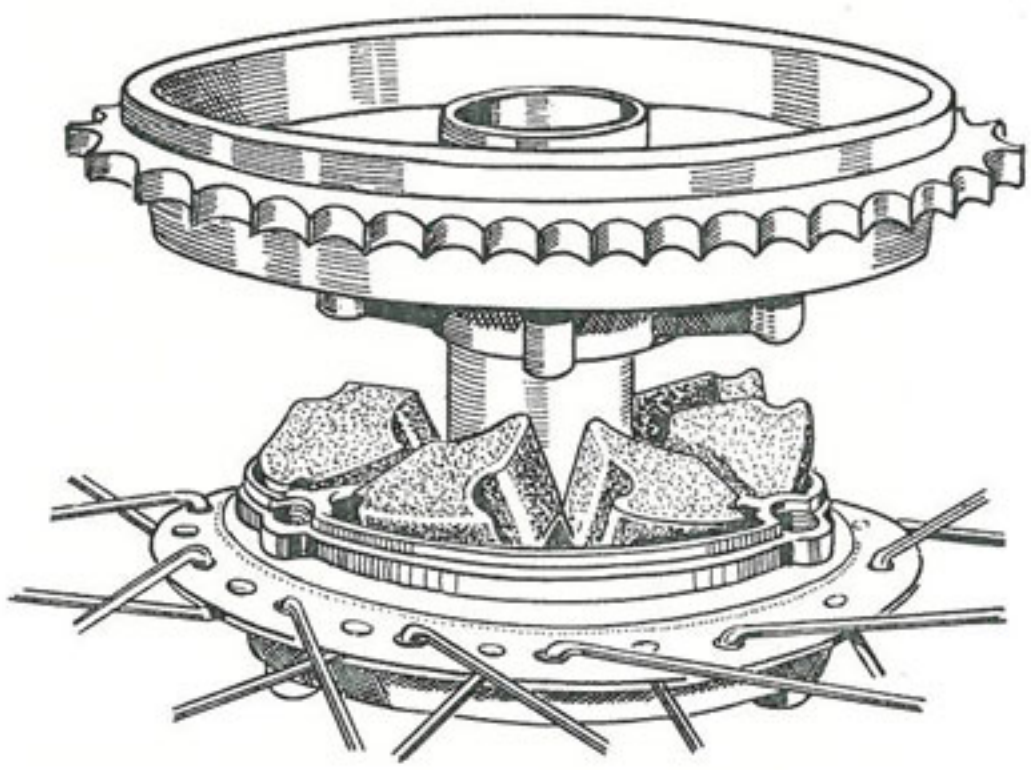
9. Removal of Brake Operating Cam and Brake Shoe Pivot Pin

The method of doing this has already been described in Paragraph 3 dealing with the 6 in. brake. The method is precisely the same for the 7 in. brake except that, owing to the different type of return springs used, it is, in this case, possible to remove the shoes from the pivot pin and operating cam before the latter are removed from the cover plate.

10. Cush Drive

The sprocket/brake drum is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar vanes are formed on the cush drive shell. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative to the hub barrel and transmitting both driving and braking torque and smoothing out harshness and irregularity in the former.

If the cush drive rubbers become worn so that the amount of free movement measured at the tyre exceeds ½ in. to 1 in., the rubbers should be replaced. To obtain access to them remove the complete wheel as described above, remove the brake cover plate complete with the brake shoe assembly, unscrew the three Simmonds nuts at the back of the cush drive shell—if necessary holding the studs, 32431, by means of the flats on the heads inside the brake drum. Drive out the three studs into the brake drum after which the sprocket/brake drum can be separated from



REASSEMBLY OF CUSH DRIVE

Fig. 4

the cush drive shell and the six cush drive rubbers can be lifted out.

When reassembling the cush drive the entry of the vanes between the rubbers will be facilitated if the latter are fitted into the driving shell first and then tilted. The rubbers should be liberally painted with soapsuds to facilitate entry of the vanes.

When reassembling the cush drive coat the inside of the bore of the sprocket/brake drum liberally with grease where it fits over the hub barrel and also put grease on the inner face of the lockring, 10097. The three Simmonds nuts should be tightened down solid as there is a shoulder on the stud which prevents tightening of the nuts from locking the operation of the cush drive.

11. Reassembly of Brake Shoes, Pivot Pin and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Make sure that the pivot pin is really tight in the cover plate and put a smear of grease in the grooves of the pivot pin and on the operating face of the cam; also on the cylindrical bearing surface of the operating cam if this has been removed. Fit the operating lever and trunnion on its splines in a position to suit the extent of wear on the linings and secure with the nut. The range of adjustment can be extended by moving the lever on to a different spline.

12. Centering Cam Housing

Note that the bolt holes in the cam housing are slotted, thus enabling the brake shoe assembly to be centered in the drum. It is not intended that on rear brakes the cam housing should be left free to float but the shoes should be centered by leaving the screws just short of dead tight. The brake cover plate assembly with the shoes should then be fitted over the spindle into the brake drum and the brake applied as hard as possible by means of the operating lever. This will centre the shoes in the drum. The screws should then be tightened dead tight and secured with the locknuts. If the shoes are not correctly centered the brake will be either ineffective or too fierce, depending on whether the trailing or leading shoe first makes contact with the drum. With the brake assembly correctly centered and the screws securing the cam housing correctly tightened wear on both linings should be approximately equal.

13. Final Reassembly of Hub before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack both bearings with grease. Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds its way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, the brake cover plate assembly, speedometer drive gearbox, distance collars, chain adjuster cams, the loose section of the spindle and the spindle nut. The wheel is then ready for reassembly into the machine.

14. Wheel Rims

The rim fitted to both types of wheel is WM2—19 in. pierced with 40 holes for spoke nipples. The internal width is 1·580 in. and the diameter after building 19·062 in., the tolerance on the circumference of the rim shoulders where the tyre fits being 59·930/59·870 in. The standard steel measuring tape for checking rims is $\frac{5}{16}$ in. wide, ·011 in. thick and its length is 59·964/59·904 in.

Note that two makes of rim are used—"Dunlop" and "Palmer Jointless." These differ in the positions of the pierced spoke holes. The Dunlop rims have a group of three holes on one side of the centre line, then a single hole on the other side, a further group of three and a single hole and so on. Palmer rims have the holes alternately spaced either side of the centre line. Both rims are interchangeable and both use the same length spokes but the method of lacing the wheel is different (see paragraph 16). Neither type of rim is symmetrical and care must be taken that they are built the right way round into the wheel.

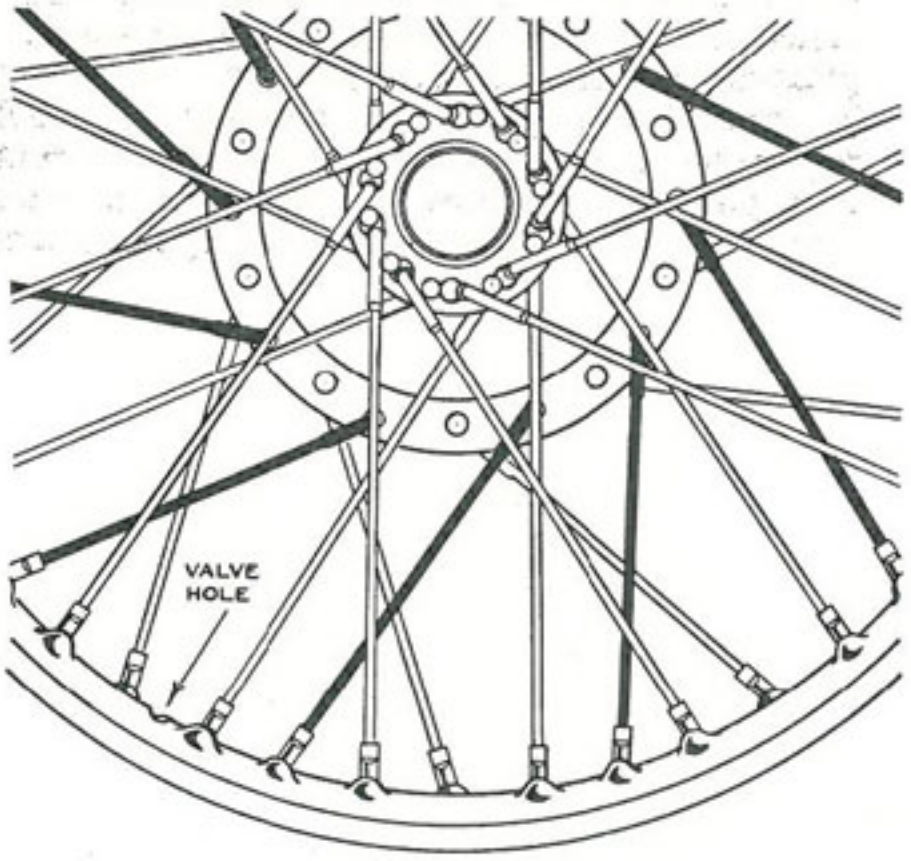
15. Spokes

The spokes are of the single butted type 8—10 gauge with 90° countersunk heads, angle of bend 95°—100°, thread diameter ·144 in., 40 threads per inch, thread form British Standard Cycle. Spoke lengths are as follow :—

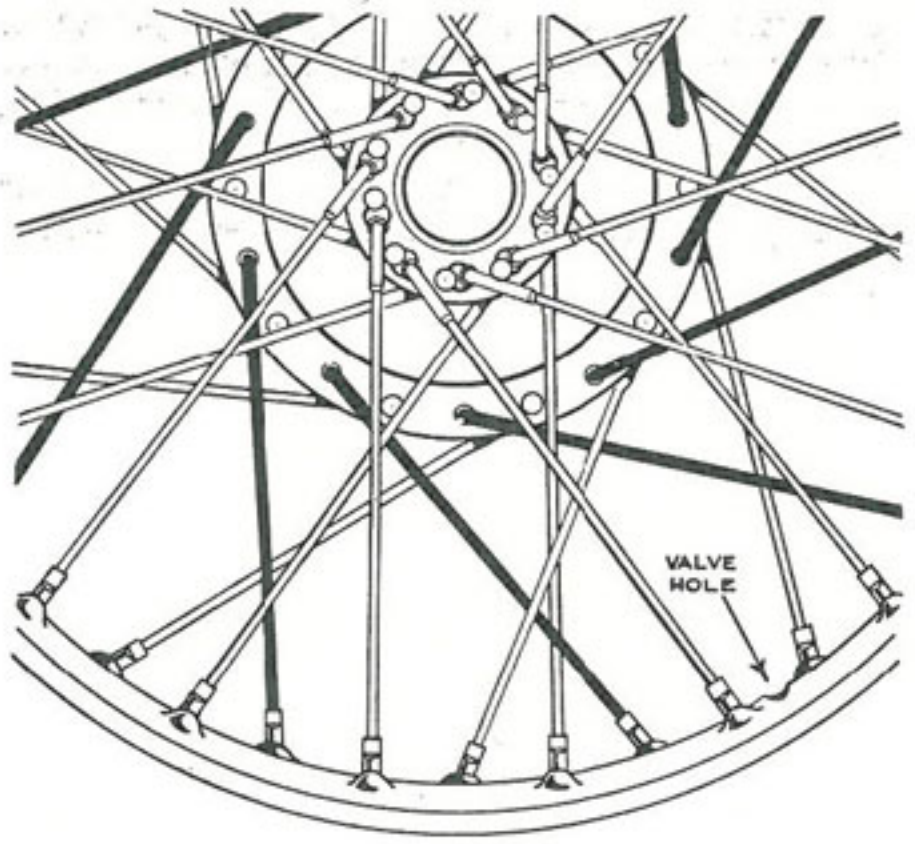
"Meteor 700," and "500 Bullet,"
Cush drive side, $7\frac{3}{4}$ in.
Spoke flange side $8\frac{1}{2}$ in.
"500 Twin" and "350 Bullet,"
Cush drive side, $7\frac{7}{8}$ in.
Spoke flange side $8\frac{5}{8}$ in.

16. Wheel Building and Truing

The spokes are laced one over three and the wheel must be built central in relation to the outer faces of the distance collars which fit between the



DUNLOP RIM
Fig. 5A



PALMER RIM
Fig. 5B

fork ends. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

Fig. 5 shows the difference between the lacing when using Dunlop and Palmer rims. The key to correct lacing is the inside spokes to the large flange on the cush drive shell which must slope in the direction shown in Fig. 5. With the Dunlop rim this spoke goes to the middle hole of one of the groups of three (see paragraph 14) and the rim must be built into the wheel so that these groups of three holes are on the right of the centre line when the cush drive is on the left, i.e. the inside spokes to the large flange cross from the left to the right of the centre line.

With the Palmer rim the spokes from the large flange on the cush drive shell go to the more steeply angled holes in the rim which must be on the left of the centre line when the cush drive is on the left, i.e. none of the spokes crosses from left to right of the centre line.

17. Tyres

Standard tyres are Dunlop 3·50—19 in. Universal tread except on the "350 Bullet" where a 3·25—19 in. Universal tyre is used.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the toolkit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark, indicating a balance point, this should be fitted near the valve.

18. Tyre Pressures

The load which the tyre will carry at different inflation pressures is shown below:—

Tyre Section Inches	Inflation Pressures—lb. per sq. in.					
	16	18	20	24	28	32
	Load per tyre—lb.					
3·25	200	240	280	350	400	440
3·50	280	320	350	400	450	500

19. Lubrication

A greasing point is provided in the centre of the hub barrel. Unless the barrel is packed full with grease on assembly (which is apt to lead to

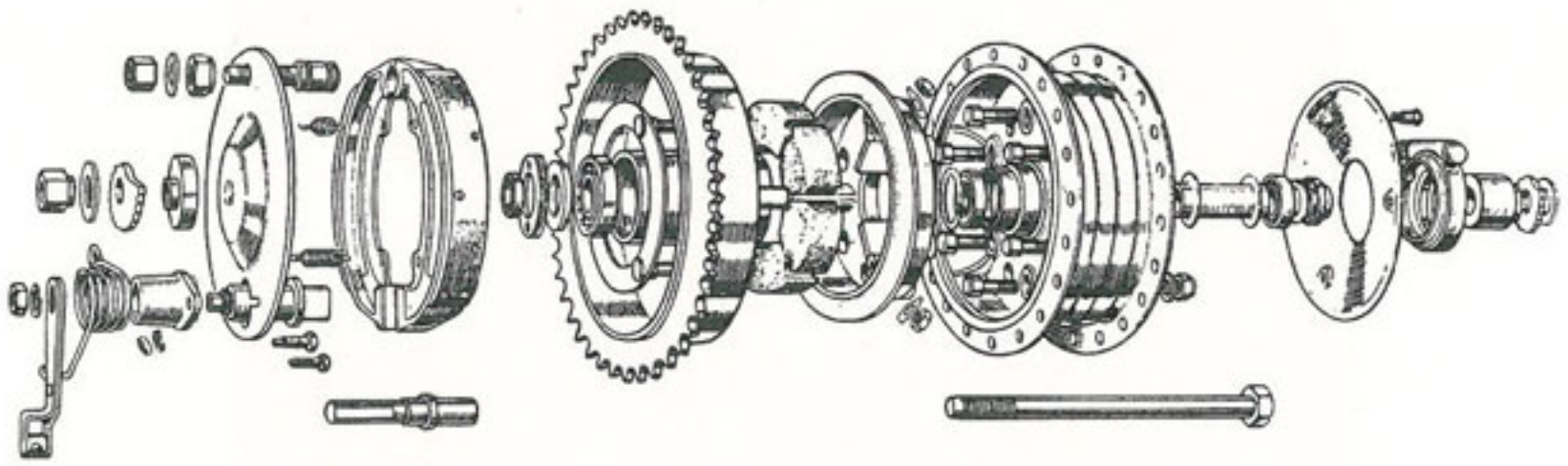
trouble through grease finding its way past the felt seals on to the brake linings) this greasing point is of little value and the best way to grease the bearings is by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

SECTION L4

Rear Wheel

(Quickly Detachable Type with 7 in. diameter Brake and Full-Width Hub)



EXPLODED VIEW OF QUICKLY DETACHABLE REAR HUB
Fig. 1

1. Description

This wheel is of the ''detachable'' type, which enables the main portion of the wheel to be removed from the machine without disturbing the chain or brake. The wheel incorporates the well-known Enfield cush drive and also a 7-in. internal expanding brake.

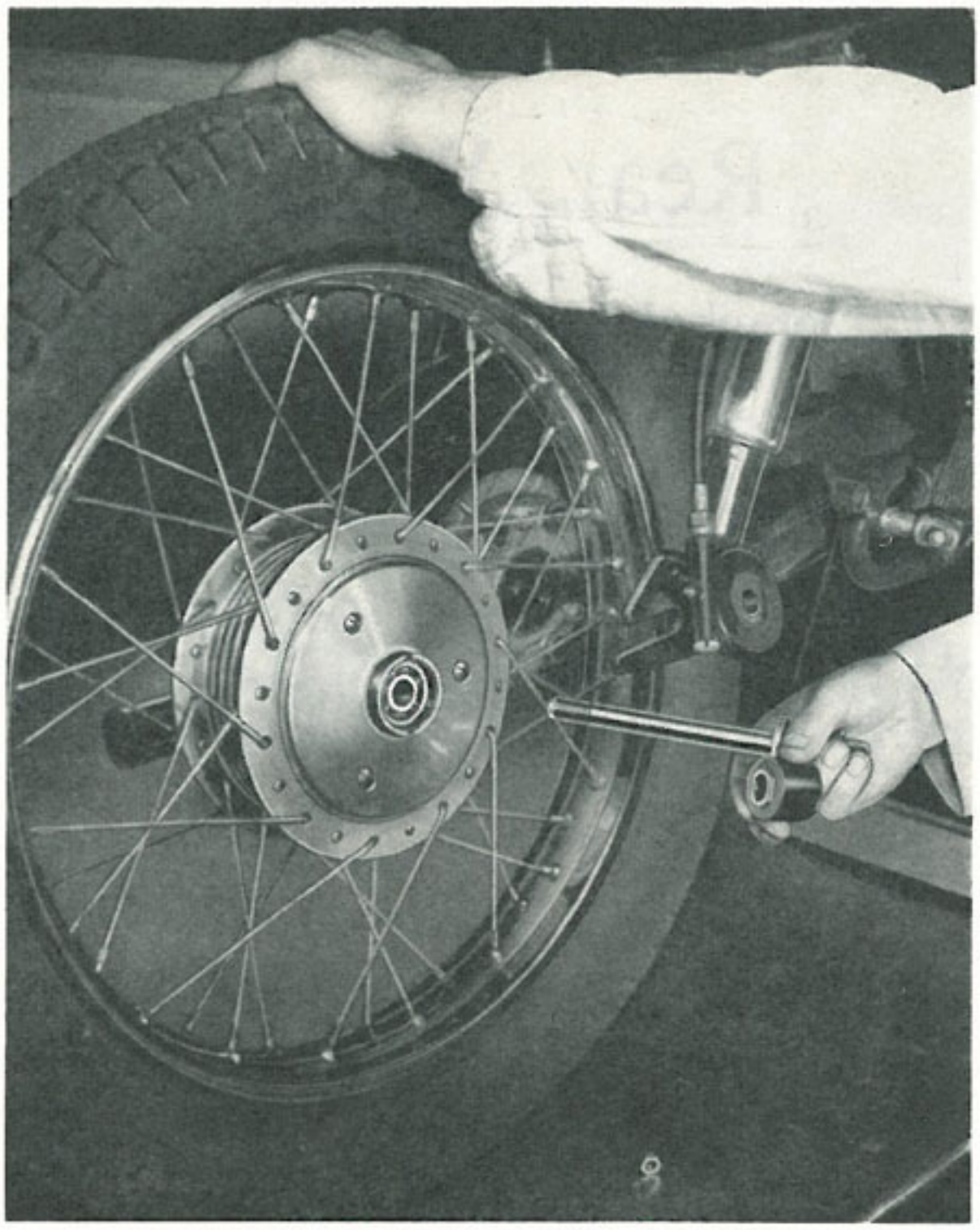
2. Removal and Replacement of Main Portion of Wheel for Tyre Repairs, etc.

Place the machine on the centre stand, if necessary putting packing pieces beneath the legs of the stand to lift the wheel clear of the ground. Remove the dual seat (if fitted) and the detachable portion of the rear mudguard. Unscrew the loose section of the spindle, 41369, and withdraw this, together with the chain adjuster cam, 36649, preferably marking this to ensure that it is replaced in the same position. Now slide the distance collar, 41372, out of the fork end and lift away the speedometer drive gearbox, which can be left attached to the driving cable. The spacing collar, 40989, and the felt washer behind it may now be removed to prevent risk of them falling out when manipulating the tyre. If, however, these are too tight a fit in the hub to come out easily they may be left in place. The main body of the wheel can now be pulled across to the right-hand side of the machine, thus disengaging the six driving pins from the cush drive shell and enabling the wheel to be lifted out of the machine.

When replacing the main portion of the wheel, reverse the foregoing procedure. The cush drive shell can be prevented from rotating when turning the wheel to engage the six driving pins, if the machine is placed in gear or the rear brake is operated, taking care, when replacing the speedometer drive gearbox, that the driving dogs inside the gearbox engage with the slots in the end of the hub barrel. Before tightening the centre spindle make sure that the speedometer drive gearbox is correctly positioned so that there is no sharp bend in the driving cable.

3. Removal and Replacement of Complete Wheel for Access to Brake

Place the machine on the centre stand and remove the dual seat (if fitted) and detachable portion of the rear mudguard as if for removal of the main portion of the wheel only. Disconnect



REMOVAL OF WHEEL (OFFSIDE VIEW)
Fig. 2

the rear driving chain at the spring link and remove the chain from the rear wheel sprocket leaving it in position on the gearbox countershaft sprocket. Unscrew the rear brake rod adjusting nut completely and depress the brake pedal so as to disengage the rod from the trunnion in the brake-operating lever. Unscrew the brake cover plate anchor nut, 7598, and remove this together with the washer behind it. Unscrew the loose section of the spindle, 41369, two or three turns and the spindle nut, 28832, by a similar amount. Mark the chain adjuster cams to ensure replacing in the same position.* Disconnect the speedometer driving cable and slide the wheel out of the fork ends, tilting it so as to disengage the end of the brake shoe pivot pin from the slot in the fork end.

When replacing the wheel make sure that the dogs on the gear in the speedometer drive gearbox are engaged with the slots in the end of the hub barrel. Make sure also that the speedometer drive gearbox is correctly positioned so that there is no sudden bend in the driving cable. When replacing the connecting link in the driving chain make sure that the closed end of the spring link points in the direction of travel of the chain. Replace the chain adjuster cams in their original positions or, if necessary, turn each of them the same number of notches to tension the chain and maintain correct wheel alignment. Do not forget to refit the brake rod and adjust the brake so that the wheel turns freely when the brake is off, while at the same time only a light pressure on the brake pedal is necessary to put the brake on.

* Note that the wheel is not necessarily correctly lined up when the same notch position is used on both adjuster cams. Once the position of the cams which gives correct alignment has been found this alignment will, however, be maintained if both cams are moved the same number of notches.

4. Removal of Brake Shoes for Replacement, etc.

Remove the complete wheel as described above, then remove the spindle nut, 28832, chain adjuster and the distance collar, 41373, thus permitting the complete brake cover plate with operating cam, pivot pin, shoes and return springs to be lifted off the hub spindle. The brake shoes can then be removed after detaching the return springs. The brake linings are bonded to the shoes and if requiring to be renewed, should be sent for servicing.

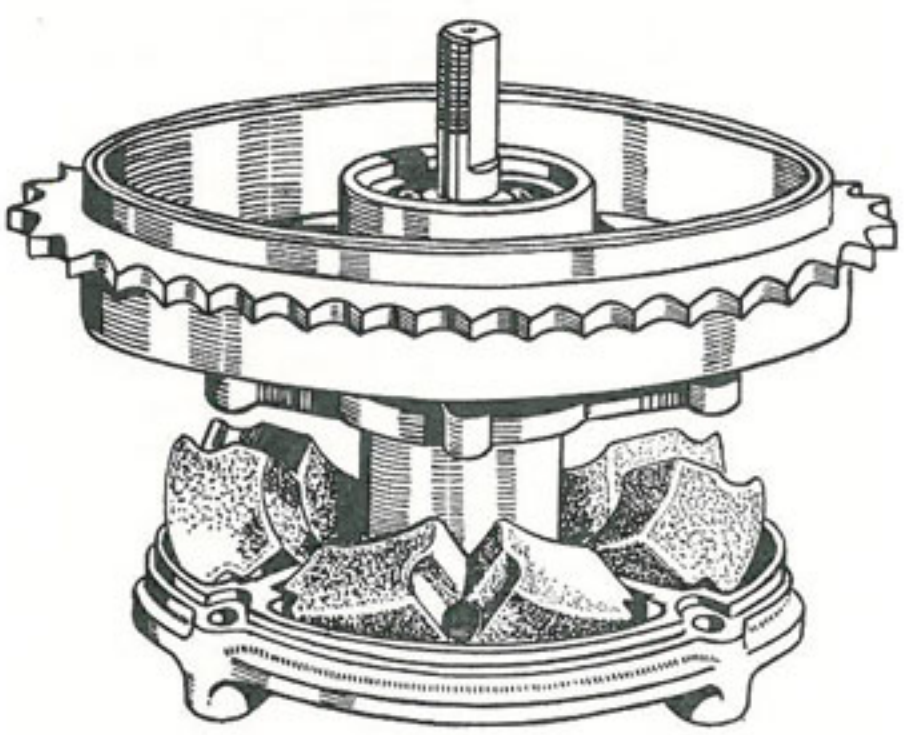
5. Removal of Brake Operating Cam and Brake Shoe Pivot Pin

The pivot pin is threaded into the torque plate, 41109, from which it can be unscrewed after removing the locknut, 41375.

To remove the operating cam unscrew the nut, 10314, which secures the operating lever to the splines on the cam. A sharp tap on the end of the cam spindle will now free the lever, after which the cam can be withdrawn from its housing.

6. Cush Drive

The sprocket/brake drum, 41233, is free to rotate on the hub barrel. Three radial vanes are formed on the back of the brake drum and three similar vanes are formed on the cush drive shell, 40967. Six rubber blocks are fitted between the vanes on the brake drum and those on the cush drive shell, thus permitting only a small amount of angular movement of the sprocket/brake drum relative to the hub barrel and transmitting both driving and braking torques and smoothing out harshness and irregularity in the former.



RE-ASSEMBLY OF CUSH DRIVE
Fig. 3

If the cush drive rubbers become worn so that the amount of free movement measured at the tyre exceeds ½ in. to 1 in., the rubbers should be replaced. To obtain access to them remove the complete wheel as described above ; then unscrew the loose section of the spindle, 41369, completely. The main portion of the wheel can then be lifted away from the assembly consisting of the fixed portion of the spindle, sprocket/brake drum complete with brake and the cush drive shell. Now remove the brake cover plate complete with brake shoes as described above, and unscrew the three nuts at the back of the cush drive shell after bending back the locking washers. The three studs, 41002, are brazed to the lockring, 10097, and should be driven out of the cush drive shell, each a little at a time to avoid distorting the lockring or bending the studs. The sprocket/brake drum can now be separated from the cush drive shell, and the six cush drive rubbers lifted out.

When reassembling the cush drive the entry of the vanes between the rubbers will be facilitated if the latter are fitted into the driving shell first and then tilted. The rubbers should be liberally smeared with soapsuds to facilitate entry of the vanes. Grease the inner face of the lockring, 10097, before assembling and tighten the three nuts down solid as there is a shoulder on the stud which prevents tightening of the nuts from locking the operation of the cush drive. Do not forget to bend up the tabs of the three locking washers.

When reassembling the cush drive, coat the inside of the bore of the sprocket/brake drum liberally with grease where it fits over the hub barrel.

7. Removal of Ball Bearings

To remove the ball bearings take the complete wheel out of the machine and separate the main portion of the wheel from the sprocket/brake drum, cush drive shell assembly, as described above. To remove the bearing from the sprocket/brake drum, first remove the brake cover plate complete with brake shoe assembly ; then remove the distance collar, 41105, and unscrew the bearing retaining ring, 41108, with peg spanner. Now screw the loose section of the spindle into the fixed section and drive out the bearing by hitting the hexagon-headed end of the loose section of the spindle.

To remove the bearings from the loose half of the hub barrel, first lift away the distance collar, 41372, speedometer drive gearbox, the spacing collar, 40989, and the felt washer, 41006. Remove the bearing retaining circlip from the driving sprocket end of the barrel. Between the two bearings is a spacer, 40995, slotted at one end to enable a drift to be used on the bearing at that end.

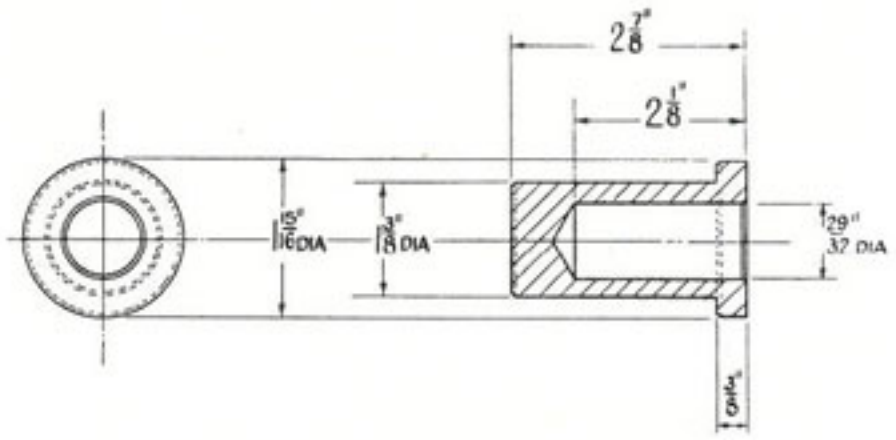
Remove this bearing first, then enter the loose section of the spindle into the spacer and drive out the remaining bearing by means of a hammer and drift applied to the hexagon-headed end of the spindle.

8. Hub Bearings

These are deep-groove single-row journal ball bearings. The sprocket/brake drum bearing is a Skefko RLS7, $\frac{7}{8}$ in. i/d, by 2 in. o/d, by $\frac{9}{16}$ in. wide. Equivalent bearings of other makes are Hoffmann LS9, Ransome & Marles LJ. $\frac{7}{8}$ in., and Fischer LS9. The two bearings in the hub barrel are Skefko RLS5, $\frac{5}{8}$ in. i/d, by $1\frac{9}{16}$ in. o/d, by $\frac{7}{16}$ in. wide. Equivalent bearings of other makes are Hoffman LS7, Ransome & Marles LJ $\frac{5}{8}$ in., and Fischer LS7.

9. Removal of Hub Driving Pins

To remove the six driving pins from the aluminium full-width hub, first remove the hub cap after unscrewing the three screws attaching it to the hub. Unscrew the six Simmonds nuts and drive out the pins.



DRIFT FOR RE-FITTING BEARING

Fig. 4

10. Refitting Ball Bearings

To refit the sprocket/brake drum bearing, use a hollow drift as shown in Fig. 4. The bearing is first fitted to the fixed section of the spindle ; the spindle and bearing are then entered into the sprocket/brake drum and driven home, preferably under a press or using light hammer blows.

The two bearings in the hub barrel are pressed in, using the drift part of E.4823. First assemble the bearing into the circlip grooved end of the barrel and fit the circlip. Replace the bearing spacer, the slot in the spacer can be at either end of the hubs, and assemble the second bearing, supporting the hub on the inner race of the other bearing. If the drift part of E.4823 is not available it is essential that the last bearing is assembled by applying pressure to both inner and outer races simultaneously to avoid pre-loading the two hub barrel bearings.

11. Reassembly of Brake Shoes, Pivot Pin and Operating Cam into Cover Plate

No difficulty should be experienced in carrying out these operations. Make sure that the pivot pin is really tight in the cover plate and put a smear of grease in the grooves of the pivot pin and on the operating face of the cam ; also on to the cylindrical bearing surface of the operating cam if this has been removed. Fit the operating lever and trunnion, 23371, on its splines in a position to suit the extent of wear on the linings and secure with the nut. The range of adjustment can be extended by moving the lever on to a different spline.

12. Centering Cam Housing

Note that the bolt holes in the cam housing, 26347, are slotted, thus enabling the brake shoe assembly to be centred in the drum. It is not intended that on rear brakes the cam housing should be left free to float but the shoes should be centred by leaving the screws, 26309 and 35140, just short of dead tight. The brake cover plate assembly with the shoes should then be fitted over the spindle into the brake drum and the brake applied as hard as possible by means of the operating lever. This will centre the shoes in the drum. The screws should then be tightened dead tight and secured with the locknuts. If the shoes are not correctly centred the brake will be either ineffective or too fierce, depending on whether the trailing or leading shoe first makes contact with the drum. With the brake assembly correctly centred and the screws securing the cam housing correctly tightened wear on both linings should be approximately equal.

13. Final Reassembly of Hub Before Replacing Wheel

Before replacing the felt washers which form the grease seals, pack all bearings with grease. Recommended greases are Castrolease (Heavy), Mobilgrease (No. 4), Esso Grease, Energrease C3 or Shell Retinax A. These are all medium heavy lime soap or aluminium soap greases. The use of H.M.P. greases which have a soda soap base is not recommended as these tend to be slightly corrosive if any damp finds it way into the hubs.

Make sure that the inside of the brake drum is quite free from oil or grease, damp, etc. Replace the felt washers, distance collars, the brake cover plate assembly, speedometer drive gearbox, distance collars, 41373 and 41372, chain adjuster

cams, the loose section of the spindle and the spindle nut, 28832. The wheel is then ready for reassembly into the machine.

14. Wheel Rim

The wheel rim is type WM2-19 in. plunged and pierced with forty holes for spoke nipples. The spoke holes are symmetrical, i.e., the rim can be assembled to the hub either way round. The rim diameter after building is 19·062 in., the tolerances on the circumference of the rim shoulders where the tyre fits being 59·930/59·870 in. The standard steel measuring tape for checking rims is $\frac{5}{16}$ in. wide, ·011 in. thick, and its length is 59·964/59·904in.

15. Spokes.

The spokes are of the single butted type, 8-10 gauge, with 90° countersunk heads, thread diameter, ·144 in., 40 threads per inch, thread form British Standard Cycle. The inner spokes are $6\frac{5}{8}$ in. long with an angle of bend 100°, and the outer spokes $6\frac{3}{4}$ in. long with an angle of bend 80°.

16. Wheel Building and Truing

The spokes are laced one over two and the wheel rim must be built central in relation to the outer faces of the distance collars 41373 and 41372. The rim should be trued as accurately as possible, the maximum permissible run-out both sideways and radially being plus or minus $\frac{1}{32}$ in.

17. Tyre

The standard tyre is Dunlop 3.50—19 in. Universal tread.

When removing the tyre always start close to the valve and see that the edge of the cover at the other side of the wheel is pushed down into the well in the rim.

When replacing the tyre fit the part by the valve last, also with the edge of the cover at the other side of the wheel pushed down into the well.

If the correct method of fitting and removal of the tyre is adopted it will be found that the covers can be manipulated quite easily with the small levers supplied in the toolkit. The use of long levers and/or excessive force is liable to damage the walls of the tyre. After inflation make sure that the tyre is fitting evenly all the way round the rim. A line moulded on the wall of the tyre indicates whether or not the tyre is correctly fitted. If the tyre has a white mark indicating a balance point, this should be fitted near the valve.

18. Tyre Pressures

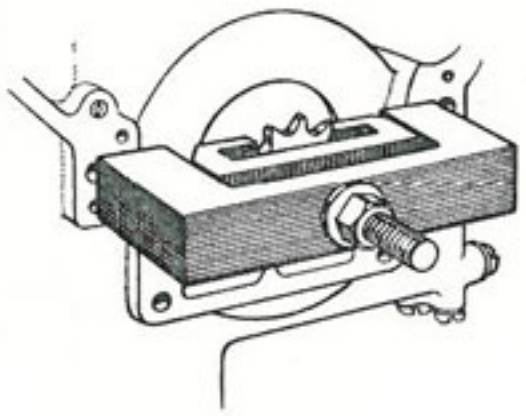
The recommended pressures for the rear tyre are 16 lb. per square inch for wheel loads not exceeding 280 lb., 18 lb. per square inch for loads up to 320 lb., 20 lb. per square inch for loads up to 350 lb., 24 lb. per square inch for loads up to 400 lb., 28 lb. per square inch up to 450 lb., and 32 lb. per square inch up to 500 lb.

19. Lubrication

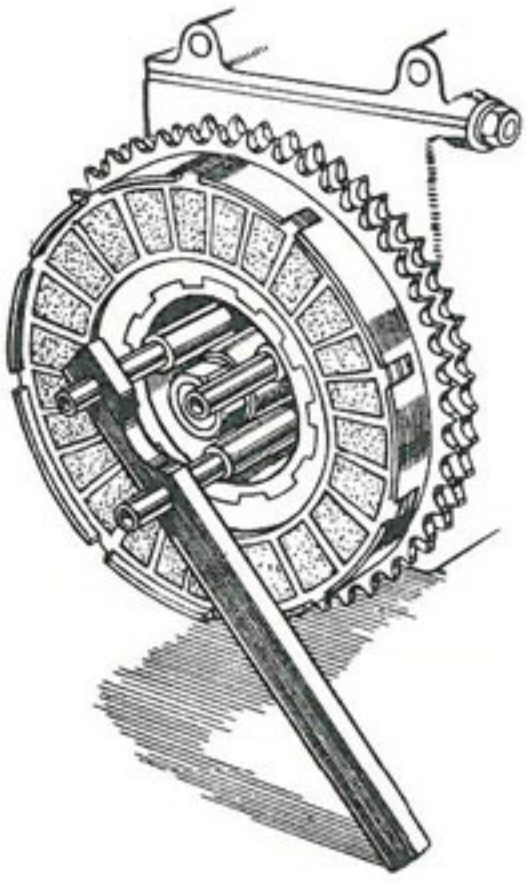
Grease the bearings by packing them with grease after dismantling the hub as described above.

Note that the brake cam is drilled for a grease passage but the end of this is stopped up with a countersunk screw instead of being fitted with a grease nipple. This is done to prevent excessive greasing by over-enthusiastic owners. If the cam is smeared with grease on assembly it should require no further attention but in case of necessity it is possible to remove the screw, fit a grease nipple in its place and grease the cam by this means.

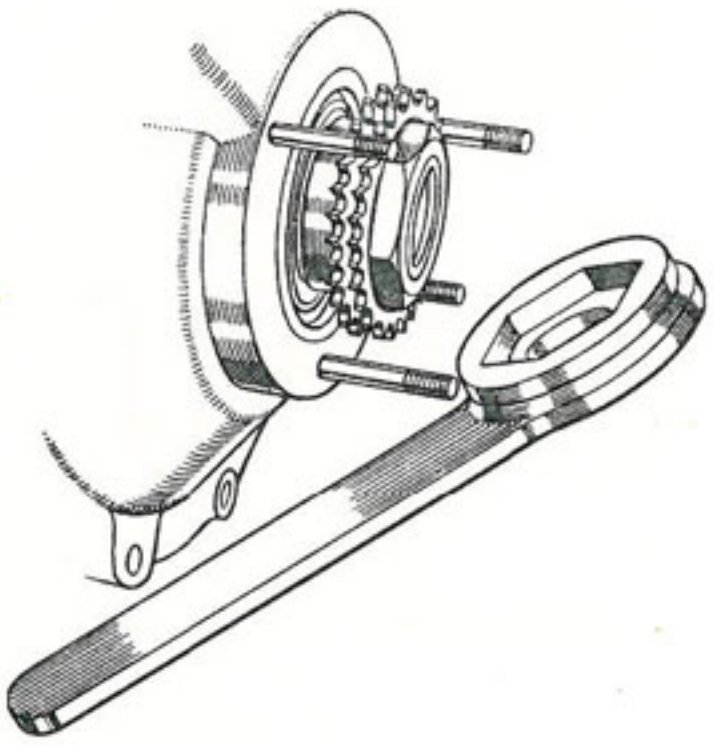
Special Tools for "Super Meteor"; "Meteor 700" and "500 Twin"



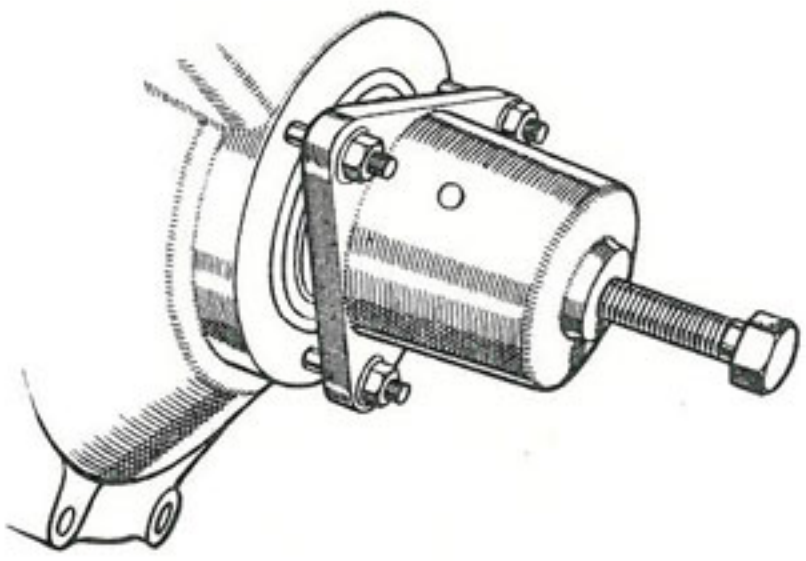
E.4869
TIMING SPROCKET EXTRACTOR



E.4871
CLUTCH HOLDING TOOL

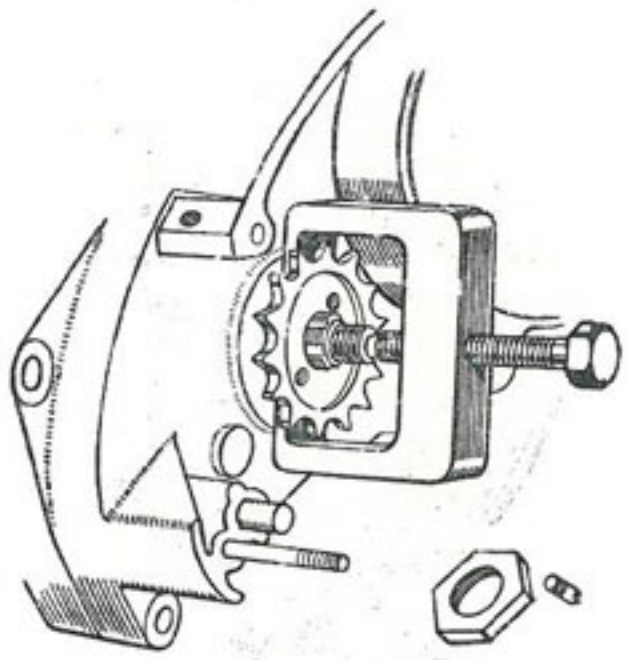


E.4877
ENGINE SPROCKET NUT SPANNER

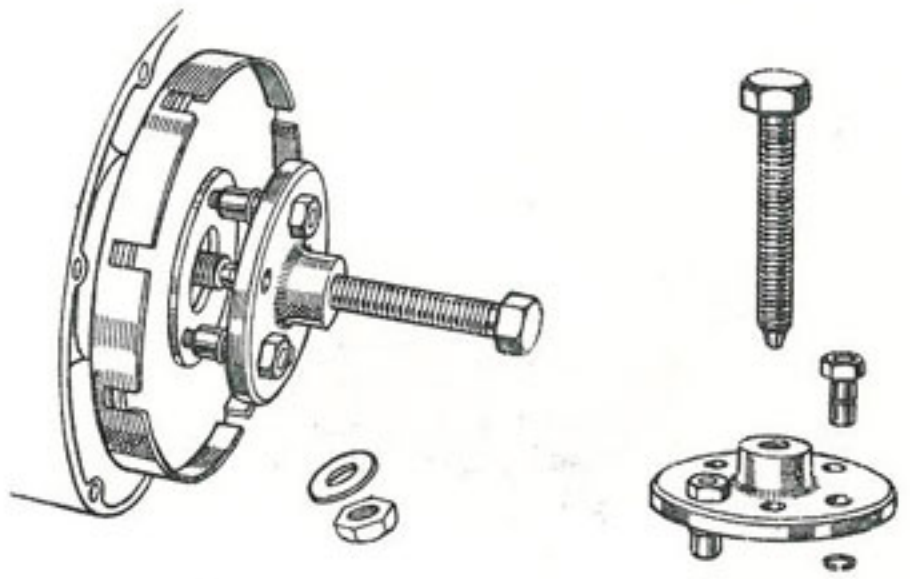


E.5121
CRANKSHAFT EXTRACTOR

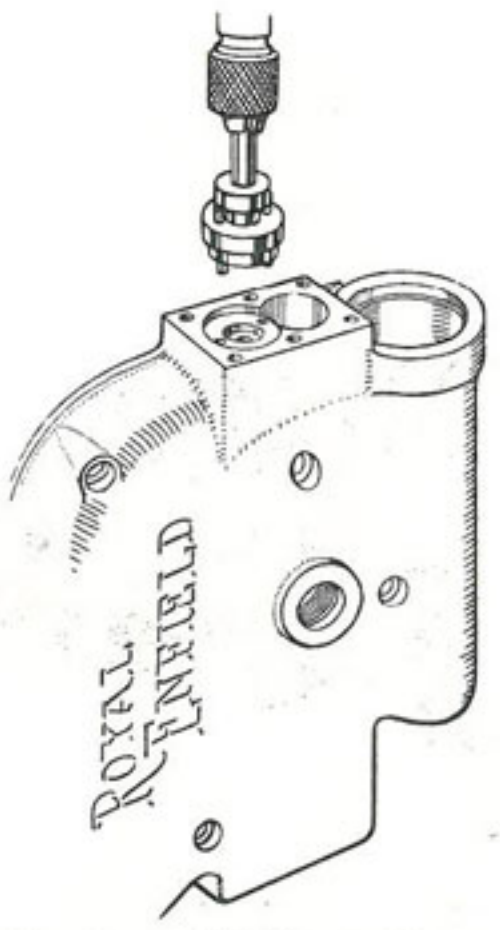
Special Tools for "Super Meteor"; "Meteor 700" and "500 Twin"



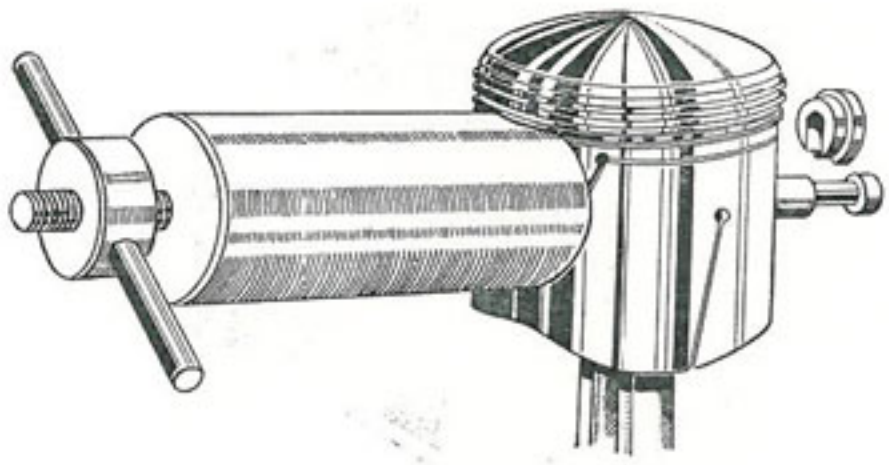
E.5127
DYNAMO SPROCKET EXTRACTOR



E.5414
CLUTCH HUB EXTRACTOR

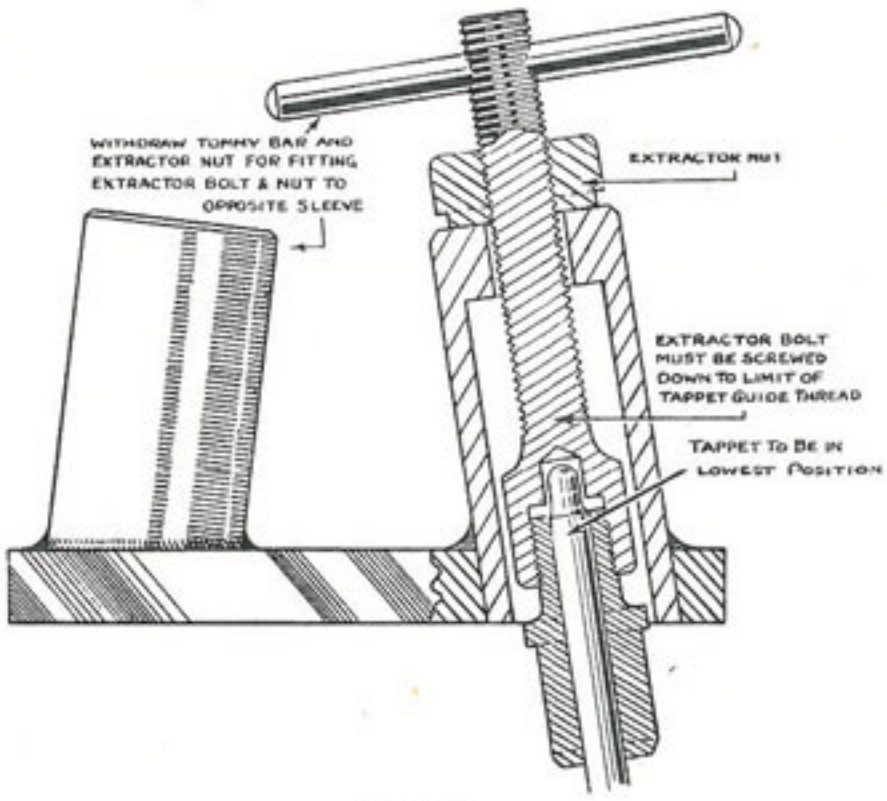


E.5425
PUMP DISC LAPPING TOOL



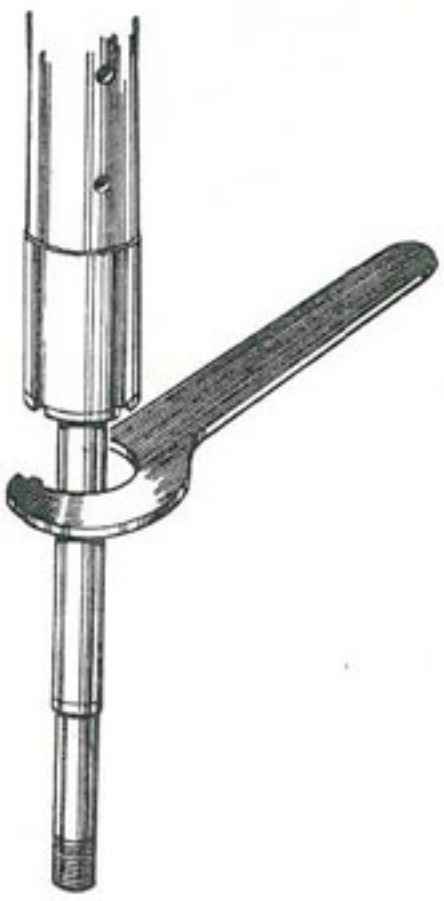
E.5477
GUDGEON PIN EXTRACTOR

Special Tools for "Super Meteor"; "Meteor 700" and "500 Twin"

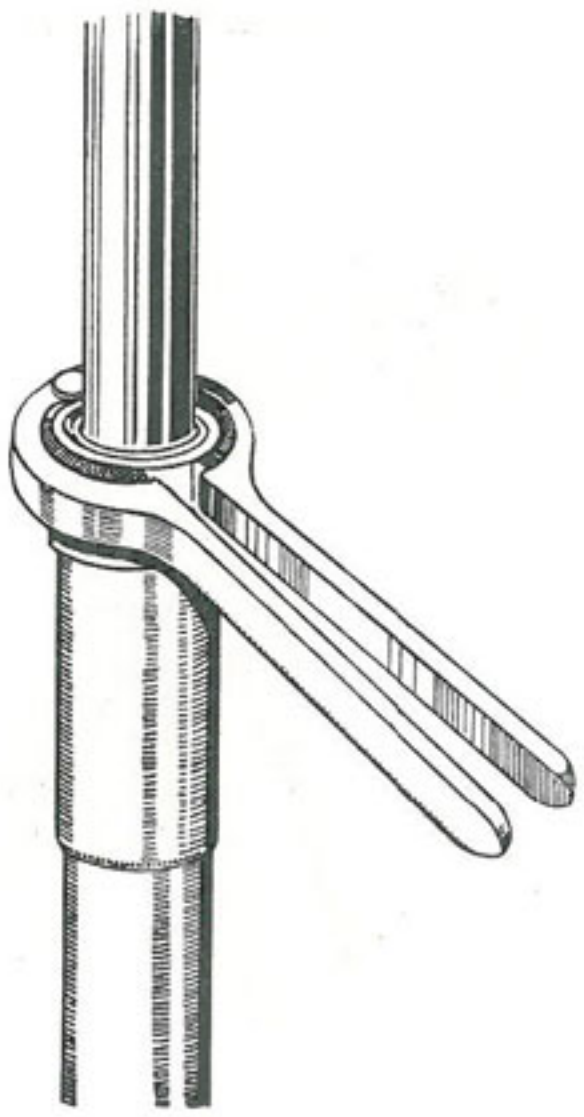


E.5790
TAPPET GUIDE EXTRACTOR

14835
MAGDYNO PINION EXTRACTOR

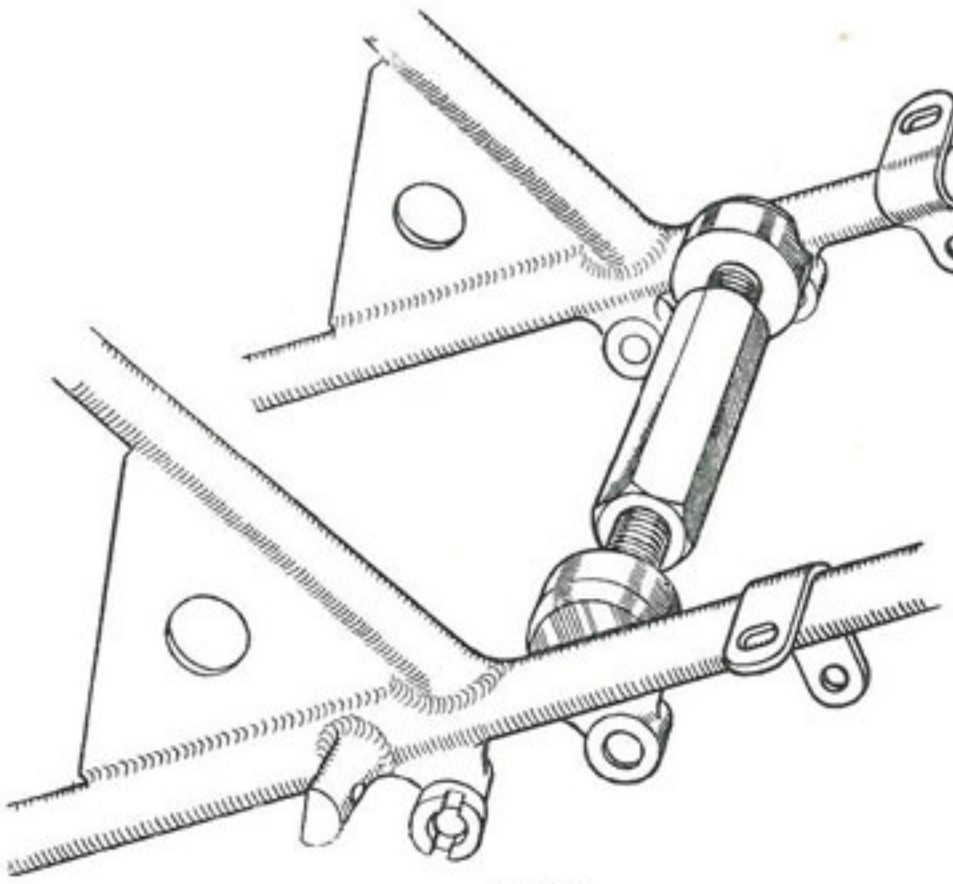


E.5418
LOCKRING SPANNER

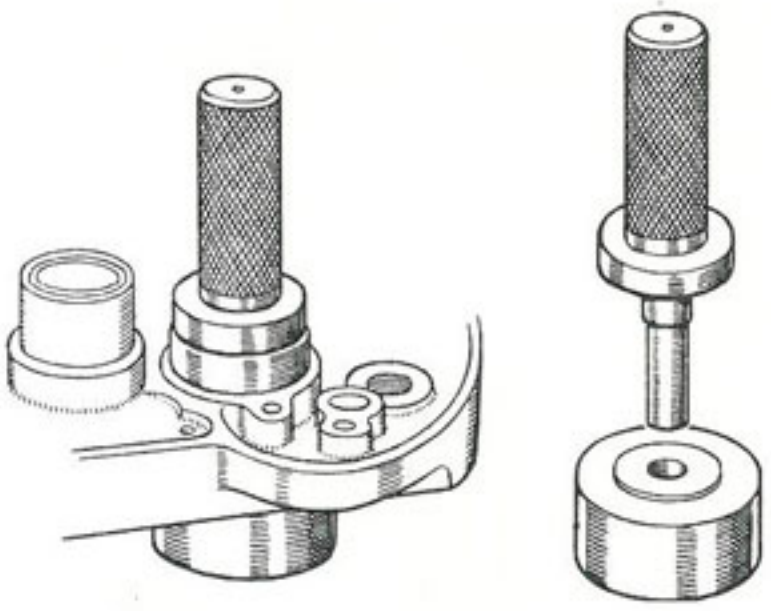


E.4912
OUTER TUBE HAND GRIPS

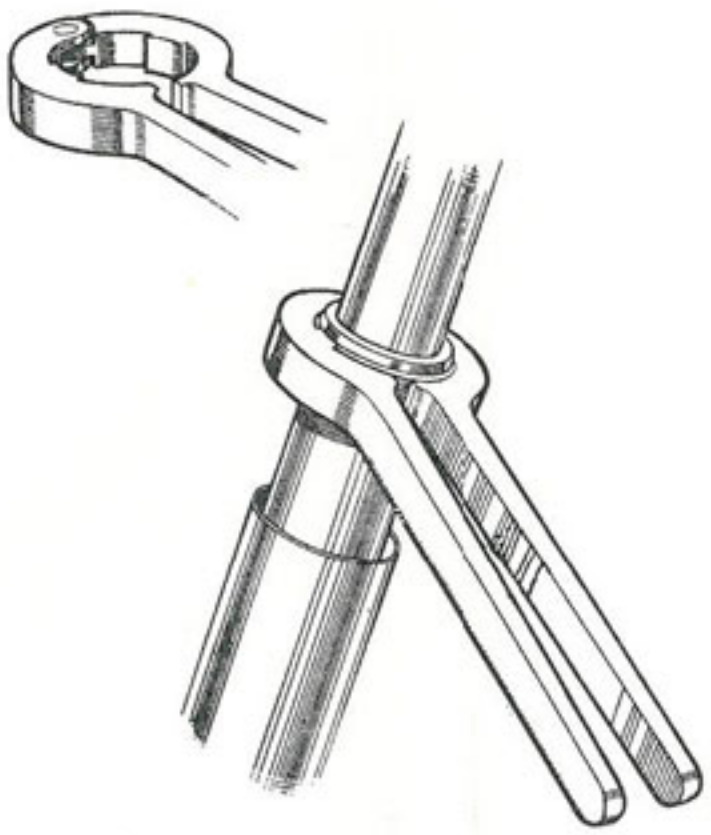
Special Tools for "Super Meteor"; "Meteor 700" and "500 Twin"



E.5431
FRAME EXPANDER



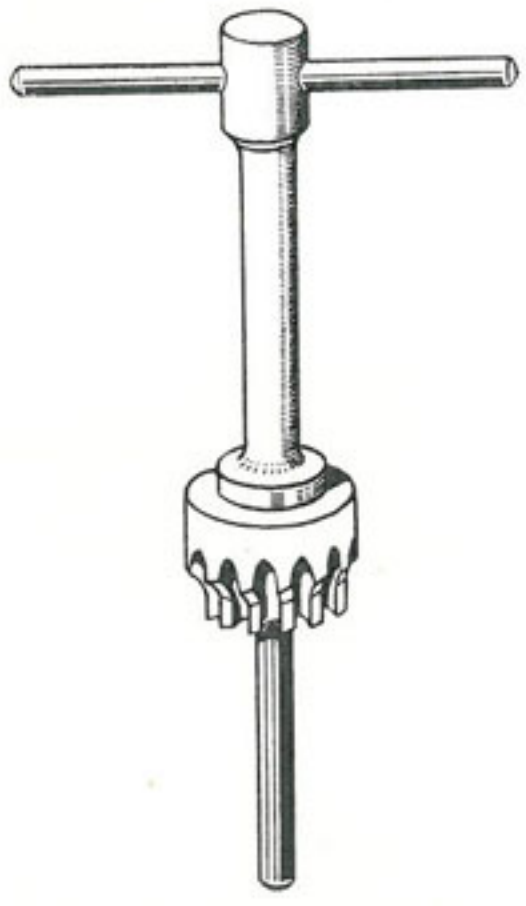
E.4823
GEARBOX COVER BALL BEARING



E.5417
GLAND NUT HAND GRIPS

SECTION M4

Special Tools



INLET VALVE SEAT ARBOR
T.2053 all models

INLET VALVE SEAT CUTTER
T.2054 Super Meteor and Meteor Minor
T.2137 500 Twin
T.1892 500 Bullet
T.1891 350 Bullet

ASSEMBLY GAUGE IN USE TO CENTRALISE ROTOR

T.2055 Super Meteor and Meteor Minor, also 1956 350 Bullet and 500 Bullet
T.2138 1955-56 250 Clipper